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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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USSR REPORT

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

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COMPUTER INFRASTRUCTURE STANDARDIZATION URGED

Yerevan KOMMUNIST in Russian 19 Aug 86 p 4

[Article by B. Melik-Shakhnazarov, director, Armenian Affiliate, All-Union Scientific Research Institute for Problems in Organization and Administration: "Informatics at the Starting Line: A Unified Code is Needed; For a Regional Module; Departmental Confusion", under the rubric: "On the Agenda: Ministries and Departments."]

[Text] Every area of human activity needs a medium in which it can function. For example, normal conditions in the material sphere require the precise operation of transportation, communications and electric power. The production of cadres is the result of a smoothly operating system of training, education and health care. Sectors of activity creating such a favorable medium are called infrastructural sectors.

A new infrastructure sector is now being formed: informatics. It supports effective intellectual activity: management, scientific, information, accounting, statistics, analysis and others. Its tools are: computer hardware, data transmission systems, software (computer languages) and systems for man-machine communication.

The most important requirement upon any infrastructure is high reliability and the standardization of parameters for system interaction. Disturbances in infrastructure operation are equivalent to cutting off electric power to factories, phone service to a ministry or light to a hospital during an operation. Standardization makes it possible to hook up any electrical device to the 220 Volt 50 Hertz electric power grid in any region in our country, or to transmit telegraph signals to any spot on the globe, as there is an international telegraphic code.

Similar requirements for informatics mean that languages for communicating with systems and methods of encoding should be highly uniform. It is necessary that automated systems in various enterprises and sectors in the Ukraine, Yakutiya or Armenia interact with one another and even jointly solve general system tasks in state administration. All this is theoretical, but what is the practical situation like?

During the 11th Five-Year Plan, in accordance with the all-union goal-oriented comprehensive scientific-technical program approved by the GKNT [State Committee for Science and Technology] and USSR Gosplan, 15 republic automated management systems are being developed, and in 7 republics data transmission systems are being studied. Fifteen and 7 main designers and managers were designated for this work.

At that time there were already about 70 branch automated systems operating at all-union ministries and departments in the country. They had their main institute developers and work managers. About 22 such branch and functional systems were developed in the Armenian SSR alone.

Naturally, with such a development procedure, none of the systems are compatible with one another, nor do they "understand" other system languages. If, for example, they want to set up a collective use computer center in the city of Kafan, in which there are enterprises in more than 20 ministries, then it is fruitless to try to communicate with them without a common language. Each enterprise officially recognizes the "language" of its ministry.

According to N. Gorshkov, chairman of the USSR State Committee for Computer Technology and Informatics, about 700,000 computer programs and several thousand ASU and computer centers have been developed in the country. If asked whether they can communicate with one another, the answer is no. Could it be that in creating a network of independent republic data transmission networks and about 14 departmental systems it was not known that their compatibility was almost excluded, that one system could not help another in case of an emergency and that they were informationally incompatible with one another? Of course, it was known. Fifteen republic automated systems are also incompatible.

Recently the GKNT approved a methodology for creating oblast, kray and city ASU, where provisions are made for main enterprise-developers and main designers and in which there is a similar call for unification, without really assuring the possibility of such unification. Based upon such diverse systems how can one create a unified general state infrastructural sector and how will it solve general system tasks?

It would be useful to analyze the experience of other infrastructure sectors in creating technical and organizational means for supporting general state activities. Communications is the closest to the informatics sector. It transmits information, while the latter processes it. In the communications sector all organizational structures and hardware are unified, having a precise modular construction. You can hook them up to any large or small city, rural area, republic or oblast. The diversity in available modules assures precise linkage and the unification of communication equipment and users throughout the entire country.

If designs, equipment and systems in the informatics sector do not meet these requirements then they must be created anew, or huge amounts spent to make various hardware and software compatible. Actually, we have created and are continuing to develop such "towers of Babel," where a multitude of languages brings chaos and confusion into any intellectual activity, including management. Additional evidence of this is the low average load for data

channels in departmental networks -- about 1-4 percent, low computer loads where only 10 percent of effective capacity is used, and the high costs for renting transmission lines and the operation of departmental systems (from 3 to 10 fold).

Because of this, the Armenian SSR has rejected the development of its own non-standard automated system. Otherwise, any attempt to integrate it into other republic, oblast and departmental systems would be practically impossible.

We have given ourselves the more difficult, but, in our opinion, advisable task of creating a standard module -- a regional automated system for a republic without oblasts, or a kray, oblast or ASSR. Actually, such a system applies to 155 out of 163 large administrative-territorial units in the country.

The creation of such a system will make it possible to copy design decisions inexpensively, and, most importantly, to integrate organizational and hardware systems and information and programs on a countrywide scale.

This entire mutually linked concept is accurately described in the appropriate documents. It was approved by the GKNT, Gopsplan, the Ministry of Communications, the USSR TsSU, Councils of Ministers in nine republics and a number of union ministries and departments. This work is headed by the Armenian SSR Council of Ministers, Armenian SSR Gosplan, the Ministry of Communications and the TsSU. In 1985 the USSR GKNT decided that eight other republics should develop data transmission systems similar to ours. However, they forgot a "trifle." Defacto, such work should be done as an all-union task, but dejure this is not done. This entire task was given to our institute, while the GKNT entrusted the basic share of the work to the Computer Center at Armenian SSR Gosplan. The ways and forms of financing the work were lost between departments. Without acknowledging its all-union character, it is legally and technically impossible to coordinate and unify programming output and the systems information and hardware base. Eight republics are waiting for us to give them design solutions, while we are waiting for them to officially acknowledge the need to do this work, for money and funds to buy equipment and put the objects into operation

Such interdepartmental confusion actually discredits a useful undertaking. The developers of centers for information transmission -- the Yerevan Division of the Central Scientific Research Institute for Communications, USSR Ministry of Communications and workers at our affiliate are firmly convinced the concept we have proposed will win recognition. It will be realized objectively "on its own." However, why should we delay its solution and not accelerate the introduction of designs which are extremely important not only for our republic, but also for the entire country?

11574
CSO: 1863/2

DANGERS IN OVERESTIMATING COMPUTER CAPABILITIES POINTED OUT

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 10, 20 May-2 Jun 86 p 6

[Interview with Academician Germogen Sergeyevich Pospelov, chairman of the Scientific Council on the Problem of Artificial Intelligence, by O. Lebedeva: "What the Computer Can Do"; date and place not specified]

> [Text] It is no secret that illusory ideas about the unlimited capabilities of artificial intelligence and endowing the computer with almost all human traits are characteristic of many people, even specialists in computer science. One can often hear that some day the intelligent robot will not only become a skilled translator of texts and an intelligent assistant in any sphere of human activity, but will also be able to think and feel on its own...
>
> Apparently, that is why Germogen Sergeyevich Pospelov began his talk with the following statement:

[Answer] I will say right away. There is no artificial intelligence in the sense that most people now ascribe to this word combination.

In fact, the computer "plays" chess and synthesizes musical works, texts, and so forth. It seemingly--I stress, seemingly--works creatively. Hence the name "artificial intelligence" appeared at one time. Actually, however, it itself does not compose music--from inspiration, or at the mind's wish--but only follows the program formulated by man, blindly obeying it. After all, we do not say that the parts making up a violin are intelligent. Then why have microcircuits suddenly become "intelligent"?

The tragedy lies in the fact that not only the "uninitiated," but also specialists, are mistaken. A so-called "anthropoid cloud" hangs over computer science, especially over the automation of creative processes. Such a situation is observed not only in our country. Its dangers are discussed both in the United States and in other developed countries.

[Answer] In my opinion, it greatly hampers the solution of urgent problems. However, it is not only a matter of this.

Network methods of planning began to be used at one time. Enterprise managers mostly acted in the following manner. They questioned executors what operations should be performed so that each of them could begin his operation. On the basis of these answers a network schedule was prepared by means of a computer. The manager, not looking, wrote on it "I approve." Then... the plan was disrupted. "Why did you disrupt the plan?" the manager was asked. "What do I have to do with this?" he parried. "The computer, science, are to blame..."

In point of fact, planning is the manager's intelligent function. The manager should not only calculate the data suitable for machine processing, but also understand (sometimes even intuitively) and take into consideration many other factors, that is, the nature of executors, their interest, the probability and scale of unforeseen disturbances, and so forth. The effect of the "anthropoid cloud," which I mentioned, is manifested precisely in the fact that an attempt is made to humanize the computer. Hence the overestimate of its capabilities and then shifting one's personal responsibility to hardware. I am talking not about the moral oversights of managers, but about the mass, quite honest and profound error of decision makers.

And what if it is necessary to make a decision under critical conditions, when a mistake can become irretrievable? In particular, this applies to the possibility of the beginning of "star wars." If the decision turns out to be erroneous, a reference will again be made to the computer: It made a mess! In fact, however, only people--people who wrote the program and people who put the computer into operation--are behind this decision. The crime was committed at the moment the program was written.

[Question] Then what, in your opinion, are the limits of an efficient computer-man interaction?

[Answer] On the one hand, as before, there is a range of operations accessible only to the computer, that is, the solution of cumbersome computer problems, when there is a shortage of time, under conditions unsuitable for man, and so forth. On the other, there are well-known man-machine systems, in which man interacts with the computer and corrects its actions. They are automated management systems and information retrieval, information-logic, and, recently, also so-called expert systems.

[Question] With what new "abilities" are they endowed?

[Answer] So-called intelligent information retrieval systems should replace information retrieval systems. They have at their disposal a much bigger information-reference system than their predecessors and can issue the necessary information to the user even when his request is not formulated clearly.

Of all the new systems expert systems are most widespread. They should accumulate experience in poorly formalized fields of knowledge, such as

medicine, history, biology, and so forth and create from it a distinctive electronic reference guide-adviser for the "narrow" specialist.

Another example. Calculation-logic systems. They are called upon to perform numerous procedures used in planning, designing, and control problems.

Thus, the man-machine mode should become the main guideline in work on artificial intelligence.

[Question] How complex is the process of interaction with such computer systems?

[Answer] The computer assistant will be used essentially in all the areas of science, production, and life. This means that the computer should be adapted for contact with any ordinary person possessing only the rudiments of knowledge of computer science. The problem of interaction of such people with the computer must be solved as quickly as possible.

Today we have become accustomed to the fact that there are mediators--analysts and programmers--between the computer and specialists, who solve their problems by means of it. They convert source information from the user's professional language first into a mathematical model and then into a program understood by the computer. Thus, as a rule, two or even three mediators, not one, stand between the end user and the computer.

In order that the computer may prepare a program for the solution of a problem according to a verbal description of its conditions, an ordinary computer is supplemented by a so-called "intelligent interface," which ensures contact with the computer in the user's professional language.

[Question] Germogen Sergeyevich, what do you consider the central problem of artificial intelligence today?

[Answer] The presentation of any kind of knowledge in a form convenient for machine processing.

As I have already stated, any computer use presupposes a triad, that is, mathematical model-algorithm of its solution-program. Superb mathematical models have long been worked out in mathematics, physics, and mechanics.

However, such models are hardly available in medicine, social sciences, and the humanities.

[Question] But then programmers and analysts will again be needed.

[Answer] Only for the creation of an intelligent interface, not for an interaction with the computer. As I have already stated, any user possessing computer literacy should directly interact with the computer in "his" language, that is, in the language of the planner, designer, geologist, architect, and so forth.

[Question] That is, in every branch of knowledge there should be people formalizing the data of this branch in a form suitable for its input into the computer?

[Answer] Quite right. Abroad they are called knowledge engineers. On the one hand, they are well familiar with the subject (for example, medicine) and, on the other, are able to formulate their knowledge so that a computer "understands" it.

[Question] Where are knowledge engineers trained?

[Answer] Nowhere and no one. Neither in our country, nor (as far as I know) abroad are there even instructors for training instructors in this specialty. Throughout our country there are, perhaps, only about one hundred specialists having the necessary knowledge and ability in this matter. This problem requires an urgent solution.

11439
CSO: 1863/332

USSR COMPUTER COMMITTEE CHAIRMAN EXPLAINS WORK

Moscow EKONOMICHESKAYA GAZETA in Russian No 18, Apr 85 p 5

[Interview with Nikolay Vasilyevich Gorshkov, chief, USSR State Committee for Computer Technology and Informatics, by V. Denisov, correspondent, date and place not specified: "More Effectively use Computer Technology"]

[Text] Our committee was set up in order to improve the creation, use and servicing of computer technology and raise its technical standards, quality and reliability. We must attain sharp improvements in the return from computer technology use, thoroughly assist in the reconstruction and technical reequipment of the national economy's sectors and accelerate scientific-technical progress.

I think that it is correct to view computer technology as a state resource intended for solving tasks in various areas of activity. One must be thrifty and economical with resources. It is time we admitted that we do not always use computer technology rationally, and that its development is taking an extensive path.

For example, today we have many thousands of medium productivity machines of the Unified Series type. However, according to TsSU data, they are only used a little more than 11 hours per day, and for so-called productive calculations, only 3-4 hours. That is, only one-sixth of these resources' productive capacity is used. This is one problem.

Here is another. In order for machines to help people and solve specific tasks, it is necessary to "invest intelligence" that is, programs and information, in them. In the past 10 years we have developed more than 700,000 different variations of programs, not more than 8,000 are registered in the all-union fund, while only a few hundred titles are disseminated throughout the country in the form of products.

A paradoxical situation arises: Each computer owner, whether it is an enterprise or association, develops its programs on its own, and, having solved a specific task, forgets that its program might be needed by others to solve similar problems. These others must also begin from zero. This leads to colossal costs. It is still quite difficult to obtain a program ready to go:

there are no legal rules or economic norms. Each unit invents something which would be very much cheaper and quicker to obtain in an organized manner.

Computer technology, with the needed information, has been created by people, for people and works under human guidance. However, training is required to communicate with machines. Once again, there is a paradox: Qualified programmer specialists are trained at practically all ministries and departments, in the Minvuz system, and at other higher educational institutions, but one cannot "crew" a new machine with them. Where are these people? Nobody keeps account of them, they dissolve in the mass of engineering-technical workers.

In short, today, we are obligated, with full responsibility and consciousness, to improve the quality of all our work.

[Question] The new committee's name includes the word "informatics". Could you reveal the content of this term?

[Answer] In popular speech, this is the science of methods and means for the machine processing of information. More precisely: informatics is the science about the principles and methods for processing and transmitting information.

[Question] Accelerated scientific-technical progress is already making great demands for computer technology by various sectors in the national economy. These demands will unavoidably continue to grow. How realisic is the complete satisfaction of all those who need equipment, programs and personnel?

[Answer] First, let me make this question perfectly clear. There are real requirements of enterprises and organizations for computer technology, and unfortunately, there is a "fashion for progress", where it is acquired for prestige purposes, to say that "we are no worse off than others". This latter does not take into account real conditions necessary for machines' effective use.

Naturally, such an approach is intolerable to us. In order to overcome it, there must be a study of the real requirements for computer technology. It is they which must be first of all met through the available resources talked about earlier. There must simultaneously be an energetic increase in new production capacity for computer and information science technology.

On the other hand, economic managers have a psychological barrier: many of them are still simply afraid of the new technology, they are cautious and prefer to work in the old manner.

This was openly discussed at the CPSU 27th Congress, which, having approved a course for accelerating scientific-technical progress, directed special attention towards the development and mass introduction of modern computer technology. Therefore, we will seriously work on activating the efficient use of computer technology in all sectors. In this work we count on help by the press, television and radio.

The newly formed committee can substantially influence the production and more effective use of computer technology. This is mainly because all these questions will be concentrated here, in one organization

I recall, that up until now the GKNT planned scientific progress and tracked its tendencies, Gosplan had the rights to directly plan computer technology production and to distribute it, while Gossnab distributed peripherals and data transmission equipment. Understandably, under such conditions it was practically impossible to estimate who needed how much equipment and who was using it. One of our most important tasks is to overcome departmental barriers.

[Question] Can you proceed similarly to intersectorial scientific-technical complexes?

[Answer] Unconditionally. The new committee is essentially the head organization for a powerful MNKT [Intersectorial scientific-technical complex] for the development, production and introduction of computer technology.

The state committee will head a diverse state system. Its direct subordinates are the organizations which we still call centers for computer services (TsVU), covering practically the entire country. Today there are more than 200 of them This number will double by the end of the five-year plan. These TsVU also have smaller subordinate units -- PVU points. There are now several thousand computer centers in the country, and the new committee can really control each of them.

It is assumed that our TsVU will become computerization centers for a given region. They will know exactly who needs how many of what machines, programs and specialists. Thus, representitives from the new committee will locally manage a region's computer potential. They will be concerned about computer conditions, repair and spare parts delivery. As new tasks appear, the TsVU can help with new programs.

Each 50-70 computer centers will form a production association, which is directly subordinate to the committee's central apparatus. Such associations will be created in every republic.

[Question] What are the first, most urgent steps that the new committee will take in the immediate future?

[Answer] The first is the devlopment and approval, within three months, of original documents: the structure, various statutes and decisions about organizations in the committee. In the next few months we will take an inventory of all the country's computer technology and information science resources, analyze their use in all ministries and departments and make suggestions about their more effective use. The work of the State Inspectorate must be immediately organized so that jointly with Gosstandart it can very soon start helping industry to produce highly reliable computer and information science technology.

Such are our plans.

11574
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ACHIEVEMENTS OF BIOLOGICAL PHYSICS UTILIZED IN ENGINEERING

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 10, 20 May-2 Jun 86 p 8

[Interview with G. Ivanitskiy, corresponding member of the USSR Academy of Sciences, director of the Institute of Biophysics of the USSR Academy of Sciences, by A. Mikhaylov: "What Will Biocomputers Be Able To Do?"]

[Text] [Answer] A new term--biotechnology--appeared during the second half of our century. It began to determine the effect of biological sciences, in particular biophysics, on the solution of technical problems and improvement in existing industrial technologies. I would like to stress that it is a matter of developments in the very near future.

I will cite several specific examples.

Of all the methods of converting chemical energy into mechanical energy living systems utilize the most effective method. It takes place at room temperature, under a low pressure, and with a comparatively high coefficient of useful effect exceeding 30 percent. Biological systems differ from existing technologies by a high miniaturization (in other words, a high concentration of energy), a low friction coefficient, and great reliability. In biological systems in the double electric layer, which appears at the boundary of the solid phase and the electrolytic solution, the energy density is 10- to 100-fold higher than the energy of the magnetic field in electric engines. An extremely effective type of "lubricant"--mutually repulsive electrically charged molecular layers--is used in biosystems.

The alluring idea of the development of a mechanochemical engine was born a long time ago. Today it has been approved experimentally. The operation of such an engine is based on the fact that the balance between the two forms of polymer, which have different mechanical properties, shifts when the chemical potential of the medium changes. Therefore, polymer can be sometimes in an extended and sometimes in a condensed state.

Hybrid systems, one part of which is executed in metal and the other consists of bioelements, have already become significant in practice.

Work on the development of a computer, where elements of the nervous system are utilized, is being done. Such computers will be supplied with sensors on

a biological basis and with actuating devices based on molecular mechanisms of muscular contraction.

Advances in molecular biology make it possible to design biosensors with preset properties, a selective reaction, and a very high sensitivity. For example, imagine a sensor in which a protein crystal is the "working body." In such a "design" rigidity is not the same in different directions. In particular, for lysozyme protein we studied factors determining this rigidity and developed methods of measuring the slightest changes in the form of protein molecules. Different modifications of biosensors can be developed on this principle.

There is another direction in the designing of microsensors--utilization of the effects of bioluminescence--that is, oxidation of reduced substances within a cell by specific enzymes, which is accompanied by the release of light quanta.

[Question] Memory devices are indispensable computer elements. Is it possible to utilize biosystems for their creation?

[Answer] I believe that today, first of all, it is necessary to talk about the utilization of active biological films, which make it possible to obtain silver-free carriers of photo effects.

In nature there is a number of so-called phytopigments, which are evolutionarily "adapted" for interaction with light. Rhodopsin--a light-sensitive substance forming part of eye retina cells in man and animals--holds a special place among them. Absorbing a light quantum, rhodopsin changes its color. For example, it is contained in salt-loving purple bacteria "Halobacterium halobium," which with the participation of rhodopsin convert light energy into electrochemical energy of a membrane potential. In this case it is called bacteriorhodopsin.

The Institute of Biophysics of the USSR Academy of Sciences discovered that dehydrated bacteriorhodopsin can "stop" at a certain stage of its photochemical cycle, preserving the image recorded on it. Naturally, the idea to utilize it as photomaterial appeared immediately. The first photofilm on the basis of bacteriorhodopsin appeared in 1978. After 4 years it was improved to such an extent that photomaterial in its parameters surpassing all known photochromes appeared.

The combination of biochrome materials with laser technology, which enables us to quickly record and erase optic information, makes it possible to develop memory devices on their basis. Information contained in a large library can be recorded on a disk made of biochrome material the size of a long-playing record.

[Question] With your answers you lead me to the inevitable question about biocomputers. In principle, however, they should be greatly inferior to existing computers, if only in their speed.

[Answer] Well, let us engage in arithmetic. In fact, the speed of impulse propagation through the nerve fiber--axon--is about 20 meters per second and the length of the excitation impulse is approximately 3 milliseconds. Nor will we forget that a reflex "tail" of excitation approximately twice as long as the impulse itself stretches behind the impulse. Thus, the speed of the computer device utilizing a network of neurons will not exceed 100 operations per second. On the other hand, high-speed supercomputers will reach approximately 100 billion operations per second in the year 2000. At first glance the comparison is obviously not in favor of the biocomputer.

However, if we talk about the molecular level of biocomputer organization, this advantage of present and future technical computer systems is insignificant.

This is why. All of us live in a nonlinear world, that is, in a world whose laws are described by systems of differential equations in partial derivatives, in other words, by nonlinear equations. Let us assume that the movement of a system consisting of a large number of different types of interacting particles is investigated. Of course, as a result, particles with new properties appear. Where to and how will such a system evolve? What will speed up its movement in a direction desirable for us and what will hamper it? Are some unexpected transitions possible in this system? An answer to these and many other questions can be obtained only with a direct numerical integration by means of a computer of the same differential equations of movement in private derivatives.

Thus, owing to the big labor intensiveness, such calculations for systems consisting of a more or less substantial number of particles are impossible. Computers do not cope with such problems. On the other hand, the need for the solution of such problems grows steadily.

The transition from a discrete procedure of calculation to the wave procedure with the utilization of computer devices on active biological films, or of special autowave chemical reactions, helps to overcome the difficulties. Essentially, this is a new general direction in computer science, a transition to completely forgotten analog devices, but a transition, naturally, at a totally new level of scientific development.

Moreover, under certain conditions crystal-like protein and enzyme films can themselves be the active medium through which autowaves are propagated.

[Question] What is that?

[Answer] It is a matter of waves in active media retaining their characteristics as constant through the energy source distributed in this medium. In other words, such of their characteristics as the period and length of a wave depend only on the local properties of the medium, while the amplitude is determined by the amount of energy stored in it.

After all, every protein molecule and elementary film cell are active elements of the medium, which can be in several stable states. For example, if a wave moves through such a medium at a speed of only 0.1 mm/s, in a linear case in

terms of a discrete variant we obtain 1 million operations per second. A film measuring 1 square centimer can contain more than 10^{12} such active elements. When a plane wave moves along such a film, 10^{12} switchings will occur here every second.

Belousov-Zhabotinskiy's vibratory reaction in a thin layer is the most known example of an active medium. This reaction in itself can serve as an analog computer for the investigation of nonlinear systems described by so-called parabolic-type differential equations. Diverse structures of spots arising in the course of the reaction tell the researcher where and how the nonlinear process will develop and are the visual solutions of these types of equations.

More than 50 autowave chemical and biochemical reactions similar to Belousov-Zhabotinskiy's reaction have been discovered to date. Some of them are color or fluorescent reactions. This makes their direct observation and utilization as analog computer devices possible.

Microtechnology, which is now being developed from biological materials, is taking the first steps, but I am convinced that in 10 to 15 years it will become an element of control of technological and research processes as widespread as the present computers to which we are accustomed.

11439
CSO: 1863/332

COMPUTER CONTROLS FOR GAS PIPELINE

Yerevan KOMMUNIST in Russian 3 Jun 86 p 1

[Article by Zh. Tekhoyan: "A Micoprocessor Controls"]

[Text] Energy resource conservation is one of the key tasks in the five-year plan. Control over fuel consumption and its rational use acquire special importance.

The experimental operation of an automated system for accurately measuring the flow of natural gas entering the republic has begun on the Kazakh-Idzhevan Main Gas Line. The system was developed and rapidly introduced by specialists at the Armtransgaz [Armenian Gas Transportation] Production Association, with the help of scientific units from the Avtomatika Scientific Production Association in Kirovakan.

The automated system is based upon microprocessor technology. Every two hours it provides highly accurate parameters for gas flow and pressure in the line, and the density, moisture and temperature of fuel combustion by customers. Previously these parameters were obtained with large margins of error by laboratory analysis. It is now possible also to obtain data on fuel chemical composition. The new device is mounted in the old control system apparatus at pumping stations.

According to specialists' calculations, the new system's annual economic effect is 242,000 rubles. At Armtrangaz a preliminary discussion of the potential for creating a unified automated system for all gas lines in the republic by 1989 has begun.

11574
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AUTOMATED SYSTEM IN PETROLEUM, GAS INDUSTRY DESCRIBED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 10, 20 May-2 Jun 86 p 4

[Article: "Electronic Correspondent Reports"]

> [Text] Today we publish a report prepared by the "electronic correspondent" of the press-center of the Ministry of Construction of Petroleum and Gas Industry Enterprises. The memory of the automated system called "electronic information bulletin" contains thousands of facts on the course of the sector's work. In only a few minutes it "examines" the information recorded on magnetic disks, "mounts" it with new facts, and immediately prints the text prepared for the press.

Almost all the projects under construction, including the biggest construction project of the five-year plan, that is, the Yamburg main gas pipeline system of a total length of more than 28,000 km, are now under electronic control in the Ministry of Construction of Petroleum and Gas Industry Enterprises.

The recent commissioning of the new automated data processing complex of the ministry's computer center makes it possible to accelerate the development of another five automated management systems. They encompass the production activity of all technological flows, trusts, enterprises, associations, main administrations, and the sector as a whole. Furthermore, specialized systems are being established: automated management system-finances, automated management system--outfitting, automated management system-job placement, automated management system-repair, and so forth.

All in all, during the 5-year period the capacity of computer complexes of the Ministry of Construction of Petroleum and Gas Industry Enterprises will double. Seven information computer centers, 50 computer management complexes, hundreds of personal computers, and 2,300 automated information processing centers will operate in the sector by 1991. All expenses on the creation of such a developed computer network will be recovered during this 5-year period.

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SOME QUESTIONS IN METROLOGICAL SUPPORT TO ASU TP

Moscow IZMERITELNAYA TEKHNIKA in Russian No 7, Jul 85 pp 64-67

[Article by K. I. Didenko and M. D. Gafanovich]

[Text] Questions in metrological support (MO) to ASU TP are very pressing and quite complicated [1,2].

One of the most important problems in metrological support to ASU TP is the validity of the record information produced by such systems (GOST 23252-78). This problem can, apparently, be solved if the ASU TP reach a level appropriate to the metrological support of traditional means of measurement (SI). As record information arriving from such means is considered valid, if is acknowledged by Gosstandart as suitable for use in settling accounts between enterprises, the determination of techno-economic indicators. etc.

The task of determining the reliability of information arriving from ASU TP is considerably more complicated. As will be shown, it has not been completely solved for traditional SI either.

By reliable [dostoverniy] will be understood information obtained from measurements, the error of which can be determined by Gosstandart sanctioned methods.

SI intended for independent use (for voltmeters, thermometers, indicating manometers, etc) or those having standardized output (input) signals (for example thermocouples, secondary instruments, manometers without output signals, etc) will be considered traditional.

We will examine metrological support for traditional SI. So far good results have been obtained in this area: within the frameworks of the State system for unifying measurements, the needed normative-technical documents for metrological support have been worked out for traditional SI (state standards, methodological instructions, etc.) standardized systems of state testing and state checking of SI, the State register of SI, etc.

However, we would like to dwell upon two problems: metrological support for the quality of the entire stock of traditional SI now in use, and the reliability of measurements made with such SI.

In order to solve the first it is necessary that the entire stock of SI in use be subjected to periodic state or departmental checking. Unfortunately, the interval between checks is usually not defined, and are the same (in the majority of cases 1 year) for different SI. We will examine how this, in our opinion works out in practice. If, during a scheduled check, a SI turns out to be satisfactory, this means that it was taken out of use for nothing, replaced with a reserve unit, moved to the checking site (sometimes in another city) and resources were used to check it and the labor of skilled specialists (checkers) was used (uselessly in this case). Positive results from checking various types of SI can be repeated several times in a row. In these cases unjustified outlays increase correspondingly. However, it cannot be excluded that at some time (a month, for example) after checking, an SI will cease to be acceptable. This inacceptability will only be discovered at the next regular check, for example, in a year.

If, during the next regular check, an SI is rejected, then the question arises as to how much time an unacceptable SI was used and what negative economic and other consequences this had.

We feel that existing recommendations for methods of determining intervals between SI checks, for example [3] permit somewhat of a statistical improvement in the matter, but do not change this situation in principle. Thus, even the strictest control over the seal [kleym] in effect for the SI does not exclude the possibility of using unacceptable SI.

From this one can conclude that the quite well worked out system for checking traditional SI does not assure the metrological quality of the entire stock of SI in use.

We examine questions in estimating measurement errors. At present there is no general state normative document establishing methods for error estimation with regard to the normed metrological characteristics of SI. Because of this, even if there is an ideal coincidence of normed values for metrological characteristics (MKh) of the SI selected with the actual error in measurements it is impossible to attain the necessary accuracy and uniqueness.

Even if the MKh were normed individually for each SI and separately for each section (scale mark), it would, naturally, differ from actual errors for this means of measurement. Thus MKh are given the same norm for all sections (in the majority of cases this is so), while the differences are even greater. As existing standards call for the norming of MKh for a type and not for each SI, the difference is even greater.

MKh changes caused by external factors are also normed for SI type and are used for all sections, ie. the norming shortcomings noted apply to them.

External factors and industrial conditions change with time. Therefore, at each moment of time, different SI can be under the effect of various or similar factors, but have different values. What is more, the value of these factors and their combination are not, as a rule, known before or during the measurement.

If it is kept in mind that the results from the simultaneous influence of several factors, even on a single SI where their values are known, cannot be determined by calculation because they are not normed then it become clear that a sufficiently reliable evaluation of external factors effect on the accuracy of measurements by calculation is practically impossible. Finally, calculation methods can not take into account the mutual influence of means upon one another. The influences of communications links and noise are just as great. One can conclude, that it is not possible to accurately estimate error on the basis of traditional SI normed for a type of metrological characteristic and that there is no general state document establishing calculation methods for such estimation.

In other words, the question of measurement reliability has not yet been completely solved for traditional SI. The lack of solutions to these fundamental problems in metrological support for traditional SI is explained by the extreme complexity of these questions. Naturally, all tasks in metrological support to ASU TP cannot be quickly solved.

We will attempt to outline step by step solutions to these questions. We will examine a characteristic example of the use of traditional measurements, where two SI -- a transducer and a secondary instrument -- are working together (See Figure 1,a), forming a complex. In this case attention should be directed to fundamental facts:

Both the trandsucer and the secondary instrument are metrologically valid, each of them has undergone state testing, entered into the state register and its MKh normed;

There is no general state normative document regulating calculation methods in estimating errors in the measurements performed by this complex;

Information on the magnitude of the parameter measured by the complex (for example fuel consumption), arriving from the secondary instrument, is considered valid;

There is no need to conduct state testing of the transducer, usually there is no question about there joint metrological certification.

From this it follows that at the present level of metrological support for autonomous SI, in order to accept the validity of measurement information arriving from a complex consisting of a transducer and a secondary instrument is is sufficient that each of them be separately metrologically valid.

It is advisable to use this point in accepting the validity of information arriving from an ASU TP.

We will analyze ASU TP functions in order to establish possible analogies between metrological support for autonomous SI and the estimation of methods and prospects for solving questions in metrological support to ASU TP.

Figure 2 presents a structural flowchart of ASU TP functions. In order to

perform a given function, hardware in an ASU TP are linked together at a given time so that information is exchanged between them. We will conditionally call this total set of hardware a functional line. We will assume that the transducer is outside of the functional line. Thus, a functional line is a total set of hardware (other than the transducer) through which information passes. Such a line, operating according to a specific program, we call a functional channel. Linked to a channel it forms a functional tract. The latter, locked onto the controlled object, is a function contour performing an ASU TP function.

Using this structure, we examine possible analogues with autonomous SI and determine that the measures and practices in metrological support to autonomous SI can be applied to ASU TP.

We turn to the example of joint work of the transducer and secondary instrument (Figure 1, a). If the secondary instrument is viewed as a device obtaining information from the transducer and converting it to a form suitable to an operator, then, from the perspective of legal [zakonodatelnoye] metrology, one can consider the functional channel of an ASU TP as an analogue for the instrument (see Figure 1, b) and the functional tract -- an analogue for the complex.

Since in both cases the transducer has the same level of metrological support, in order to make the information arriving from the ASU TP valid, it is sufficient that the functional channel be metrologically valid. Formally, there are two ways of doing this: state reception testing and metrological certification.

In our view, state reception testing of ASU TP is not practical, as ASU TP are a special type of product which appear only with the installation of hardware and equipment obtained from different manufacturers. There are no technical conditions for ASU TP and, as a rule, only one copy of each is sold.

For the same reasons, state reception testing of functional channels is impossible. This leaves their metrological certification.

Thus, in order to make valid the information arriving from an ASU TP it is sufficient to metrologically certify the corresponding functional channels.

We note that questions in the metrological certification of functional channels can be solved right now and it is advisable to include them in the first stage of work on ASU TP metrological support.

Obviously, estimating the error in a functional tract is as complicated as estimating it in a complex consisting of a transducer and a secondary instrument. This requires serious research which, for the most part, should, be done at this stage.

Estimating the accuracy of information in a functional channel is, perhaps, more complex than estimating error in measurements performed with the help of the complex. A practical solution to this problem -- assuring the reliability of information arriving from an ASU TP -- is still not foreseen. In any case,

it cannot be solved before the reliability of measurements made with the help of the complex is assured. This is stage three work.

Figure 2 also gives a qualitative presentation of the sources (components) of functional contour error. If error in a functional line is determined by error in the equipment forming this line, then error in a functional channel also includes error caused by peculiarities in the algorithms for the collection, storage and processing of information and in the corresponding programs.

In addition to these, error in a functional tract also includes errors in the transducer and communications lines.

As far as the functional contour is concerned, its accuracy depends upon all the errors examined, as well as upon methodological, dynamic and other errors caused by functional tracts and the object controlled.

The question arises: As an ASU TP is the realization of a new, higher level of theory and practice in instrument building, does it make it possible to more feasibly and economically solve questions in the establishment (or production) and approval (or operation) of metrological acceptability of hardware and the system as a whole. It turns out that there are such possibilities.

One of them is "built in" control of metrological suitability. A system equipped with such control checks and approves the metrological suitability of functional channels automatically in a given interval (for example, after each cycle) or as a result of analyzing system functioning.

If metrological unacceptability is discovered it is automatically reported to an operator, and a diagnostic program is engaged to automatically search for the unacceptable element. After the element has been replaced the ASU TP functional channel continues to work.

"Built in" control is very effective. It makes it possible to avoid traditional periodic checking of functional channels and their hardware. It is no longer necessary to stop the system and a checker is not needed. It provides for the complete and continuous metrological service of each piece of hardware, as they operate right up until the need repair or replacement (without any forced stops in operation as required by traditional checking). It guarantees the correspondence of metrological norms to all hardware in operation and reduces the stock of equipment (there is no need for replacement items during checking).

Thus, it is possible to solve one of the main problems for ASU TP -- assuring continuous guaranteed metrological quality for all operating functional channels of an ASU TP.

"Built in" control gives an ASU TP a higher level of metrological support than do most autonomous SI.

Naturally, it is necessary to work out principles and documents making possible the use of "built in" control over the metrological certification of ASU TP functional channels as a variety of state or departmental checking.

As far as the total error of a transducer or functional channel (functional tract) is concerned, here, as a rule, only calculation methods are used. These have specific difficulties (similar to autonomous SI).

However, ASU TP have advantages here as well: Individual MKh in working conditions (determined experimentally during metrological certification) are known for functional channels, while traditional SI, as a rule, only are normed for the type of MKh applying to normal conditions. This substantially reduces the difference between real total error and that obtained by calculation.

Connecting a functional tract to the object controlled leads to methodological errcr in an ASU TP and makes possible somewhat of an increase in measurement accuracy and representitiveness due to the statistical processing of measurments, the determination of their average, highest and (lowest) value, etc. At present this is unatainable for traditional SI used in industry and which are not equipped with microprocessors.

We examine the area for applying calculation and experimental methods for determining error or limits of their permissible values for functional tracts in ASU TP.

The need to estimate functional tract accuracy arises in ASU TP design and introduction stages. The experimental method of accuracy estimation is not practical for the first stage, therefore, it is necessary to use calculation methods.

In the design stage the actual features of operating conditions and parameters for the object are only guidelines.

On the other hand, it has been shown that modern methods for norming MKh (just like accuracy characteristics) do not sufficiently approximate the normed values to actual ones, while their is no state methodology for calculating errors in a complex consisting of two or more SI.

Therefore, at the design stage the accuracy of a functional tract can only be roughly approximated. The estimate are usually on the high side.

During metrological certification in the design stage the Mkh of functional channels are determined for conditions closest to real ones.

In some cases experiments succeed in determining the MKh for functional tracts. However, as a rule, these characteristics must be determined by calculation methods, which have well known shortcomings.

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COMPUTER COMPLEX FOR ALUMINUM ALLOY QUALITY CONTROL

Kiev TECHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 2, Feb 86 pp 32-33

[Article by O. M. Byalik, doctor of technical sciences, A. A. Smulskiy, V. S. Pikovskiy, L. V. Golub, candidates of technical sciences, and A. I. Shapoval, engineer]

[Text] Kiev Polytechnical Institute has developed an information measurement computer complex (IIVK) for quality control of cast aluminum alloys.

To record rapidly occurring processes in a cooled specimen of molten metal, computerized equipment is used that automates the process of measurements and calculations and does these operations with high accuracy.

In realization of the "Analiz" developed program, the technical characteristics of IIVK enable: measurement of the temperature of heating and overheating within ±1 percent; determination of silicon content with accuracy of ±0.25 percent, copper -- ±0.15 percent, iron -- within the range or beyond GOST requirements; evaluation of porosity (above, below, or within the limits of requirements of technical specifications of the enterprise); evaluation of mechanical properties (within the limits of GOST specifications or below); recommendation of the most economic burden calculation when it is necessary to get metal with maximum mechanical properties, and also when the content of silicon and/or copper does not meet GOST requirements; output of recommendations on the necessity of refining or modification; obtaining initial data for automated complexes of controlling the melting process.

IIVK is designed around the series-produced 15VUMS-28-029 equipment set with "Elektronika-60" microprocessor. The set also includes an Shch68000 digital voltmeter and a sampler.

Example of interaction with IIVK:

1. Day, month, year?
2. Silumin, percent silicon content? 12.2
3. Its cost, rubles per metric ton? 805
4. Metallic silicon, percent silicon content? 98
5. Its cost, rubles per metric ton? 845
6. A8 Aluminum, percent silicon content? 0.3

7. Its cost, rubles per metric ton? 830
8. MO copper, percent copper content? 98
9. Heat number? 372
10. Time of taking sample in mold, hours:minutes? 13:20
11. (0 = yes) analyze? 0
12. Taking 1315 points
13. Transferring 219 points to curve number 372
14. Initial point TO = 44.8 with 1 s interval
15. A.TO. T.OB.sk.ek
16. Parameters of crystallization of sample of heat number 372

	Time, s	Temperature, °C	Rate, %/s	Volume, %	Volume of phase components, %
17.					
18.	53.8	603.8	0.0173	0.02	
19.	65.8	588.6	1.6452	5.22	
20.	123.8	559.5	0.4555	48.29	48.29
21.	137.8	552.5	0.8398	56.83	
22.	213.8	596.3	0.0599	88.90	40.62
23.	221.8	502.8	0.863	92.09	
24.	228.8	500.2	0.2175	95.19	6.29
25.	234.8	497.3	0.5574	97.45	
26.	244.8	491.3	0.0058	100.00	4.81

27. Alpha 0.036 (1/s), DT_{max} = 175.4°C
28. Date 18-12-4, time 13:20
29. Results of analysis of sample of heat number 372
30. Temperature: 738.2°C; overheating: 146.3°C
31. Content of elements
32. Silicon: 5.68 percent; copper: 7.09 percent
33. Iron: within norm
34. Ultimate strength within GOST norms
35. Porosity greater than norm
36. Content of nonmetallic inclusions greater than norm
37. Refine 1 percent of flux
38. (1 = yes) optimize properties? 1
39. To improve properties, it is necessary to add to the burden
40. Metallic silicon: 0.26 percent
41. Metal ready for teeming
42. Foreman (signature)

The first nine items are questions of the operator about the burden in the plant. These data are input once at the beginning of a shift. The data of items 10 and 11 are requested before each measurement and are input by the operator. Items 12-15 constitute a message of operation of the unit (A -- the coefficient has been calculated that characterizes the rate of cooling of the metal in the molten state; TO -- initial temperature has been determined; DT -- maximum value of temperature difference at the end of crystallization has been found; OB -- the volumes of phase components of the alloy have been determined; ek -- extrema have been found on the curve for the rates of growth of solid phase). Items 16-27 list only the extremum rates of growth of phase components and the corresponding values of time, temperature, volumes from the start of

crystallization, and volumes of phase components of the alloy. Item 28 gives the time of taking the sample. The other items list the results of analysis of the sample of the heat, and give recommendations on refining the alloy and optimizing its properties.

Industrial tests of the information measurement computer complex and its software have confirmed the feasibility of evaluating and controlling the quality of cast aluminum alloys with very little delay (5-10 minutes).

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SCIENTIFIC RESEARCH AUTOMATION DESCRIBED

Moscow EKONOMICHESKAYA GAZETA in Russian No 18, Apr 86 p 17

[Article by Professor V. Ya. Maysnikov, chief, Main Administration for Computer Technology and Management Systems, under "School of Computer Literacy" rubric: "The Automation of Scientific Research"

[Text] One of the main problems in contemporary scientific research is the reduction in time allocated to it. Scientific and technical ideas and technical-economic characteristics become obsolete even before the projects which embody them are introduced. Therefore, improvements in research quality and reductions in research time are necessary conditions for accelerating scientific-technical progress. The idea of using computers to automate scientific and technical information processing began to materialize back in the 9th Five-Year Plan. Physicists became pioneers in this field. It is among them that automated scientific research management systems appeared. Computers were the technical basis for this.

Automated scientific research management systems, or ASNI for short, are now being created in other sectors of science and industry. Modern ASNI are distinguished by the extensive use of computers for collecting, processing and producing data and by the real time management of experiments. Here use is made of high speed computers with developed peripherals and large memories making it possible to process huge amounts of information and solve complicated tasks, and to sometimes simultaneously manage several independent groups of research problems.

After the introduction of ASNI for photography from artificial satellites, the time required for processing was reduced to 2-3 minutes from the 3-4 hours required by the previous method; while structural determination in crystallography takes 50-100 hours instead of 2-3 years. ASNI's for research on the mechanical properties of polymers accelerate experiments and results 30 fold. There are many such examples.

We will examine a simplified structural scheme for an ASNI. Information on the object being studied flows, in the form of electrical signals, from transducers to a measurement apparatus. This apparatus includes lines, amplifiers and converters for changing analog signals into digital ones, all items are protected from noise. Special devices, called interfaces, connect

all this to a computer, which processes data. This is the location for researchers' interaction with the system. These include the screen, alphanumeric printer and monitors for obtaining documentary material.

Given such a configuration, we approach experiment management. Data and commands which influence the measurement channels or devices measuring the condition of various system elements flow from the computer through the interface to the measurement apparatus. This configuration is used in practically all ASNI.

There now hundreds of such systems operating in the country. They are created and improved in accordance with a program approved by the USSR State Committee for Science and Technology, USSR Gosplan and the USSR Academy of Sciences.

A recently approved CPSU Central Committe and USSR Council of Ministers decree is directed towards accelerating the development and production of instruments and facilities for automating scientific research. This decree foresees the preparation of a general state program for the creation of instruments and facilities for automating scientific research during 1986-1995. Special attention is given to the production of instruments needed for the priority directions in science and technology.

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AUTOMATING DATA PROCESSING ON THE RAYON AND OBLAST LEVELS

Moscow FINANSY SSSR in Russian No 5, May 86 pp 59-62

[Article by A. P. Kolesnik, deputy director, computing and data processing center, RSFSR Ministry of Finance, K. V. Golovin, division chief, main computer center, USSR Ministry of Finance, and V. Z. Usov, division chief, main computer center, USSR State Bank]

[Text] The automated system of finance calculations (ASFR) is structurally set up in accordance with the hierarchical organization of the finance system. There are four levels: union, republic, oblast, and rayon. The development of the system on these levels is different. The union level is being set up by the main computer center of the USSR Ministry of Finance, and is the only one of its kind. The main functions to be automated on this level are determined by interaction with other union agencies and with the republic level of the ASFR.

The republic level is being developed by the computing and data processing centers of ministries of finances operating in all union republics with the exception of the Tajik and Turkmen republics.

On the oblast level, various organizational forms are being used for putting computers into practical operation in finance agencies. In the RSFSR, ten computer centers have been set up that are handling tasks of the ASFR and the automated system for management of State Insurance. In the RSFSR and the Ukrainian SSR there are divisions of the ASFR in finance agencies of the oblast unit, and collective-user computer centers are also being used.

The republic and oblast levels of the ASFR are functionally coincident to a great extent. This is due in particular to their position among other agencies of State management, and consequently to the streams of information that pass through the system (Diagram 1). Taking Moscow as an example, it has been experimentally demonstrated that it is feasible to extend design approaches and programs of the republic level of the ASFR to the oblast level. About 15 tasks designed for the republic level were introduced in the Moscow municipal financial administration from June through December 1984 by personnel of the computing and data processing center of the RSFSR Ministry of Finance.

Concepts of development, equipment installation and operating procedures have been worked out for all levels that we have discussed. The same cannot be said

about the rayon level, which is the source of all accounting and report information of financial agencies that is checked, generalized and analyzed on subsequent levels. The rayon financial departments work directly with enterprises, budgetary institutions, and other facilities of the economy that disburse or receive monetary resources.

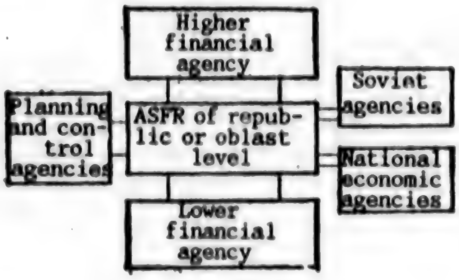

Diagram 1

ASFR information flows of republic and oblast unit

Another feature that is unique to the rayon level of the ASFR and has a considerable effect on options for setting it up is the large number of finance agencies. For example, in the Russian Federation there are about 2100 rayon finance divisions (including those within cities).

The importance of functions of primary accounting and monitoring, which to a great extent determine the activity of finance agencies of all levels, makes it imperative to automate data processing in the rayon divisions. As of now, the resolution of this problem has taken two directions. The first is being developed by the Estonian Ministry of Finance, where the feasibility of installing computers directly in rayons is studied and experimentally investigated. Of greatest interest in this connection is data processing in cooperation with the rayon units of other finance-credit agencies: insurance, State Bank, construction bank, and State worker's savings bank agencies. Studies that have been done up to the present time are oriented toward installation of SM-1600 computers in the rayon with division of their resources among the five enumerated finance-credit agencies (Diagram 2). The estimated cost of the hardware complex is roughly 400,000 rubles for one rayon.

The second direction is being developed in the RSFSR, and is based on two premises. First of all, maximum relief of financiers of the rayon unit from work in accounting and calculations so that they can devote more time to economic control activity. Moreover, rayon financiers must get information that has already been analyzed, which would define what managerial decision must be made, and what enterprise should get first attention. The second premise is the availability of automated systems in other finance-credit agencies; the most highly developed of these systems is operating in the USSR State Bank. Support of interaction with this agency is a crucial task, as it is through its institutions that the overwhelming majority of State income passes and budgetary cash transactions are carried out. The OASU [automated sector management system] of the USSR State Bank is based on centralization of data processing in the oblast

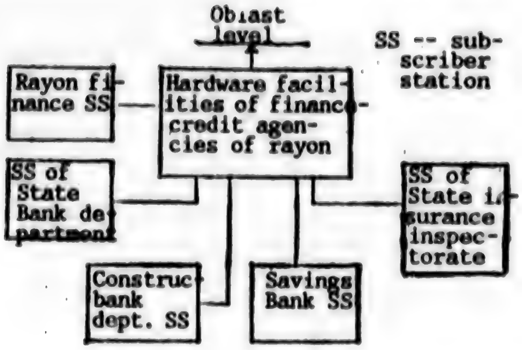

Diagram 2

Experimental research complex of technical facilities of finance-credit agencies of rayon unit

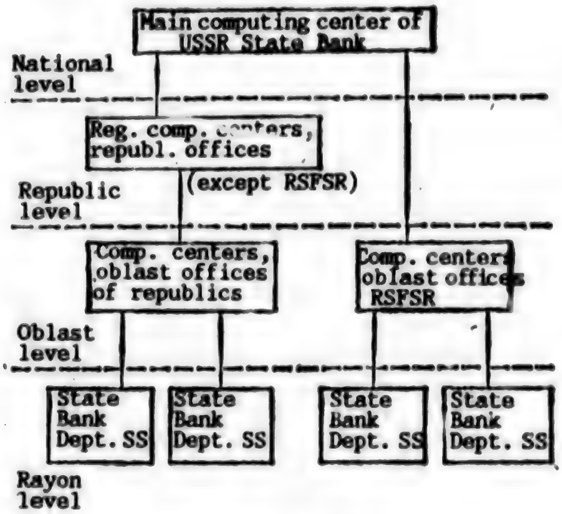

Diagram 3

Structure of OASU of USSR State Bank

unit. The simplified structure of the system is illustrated on Diagram 3. Its distribution by levels coincides with that used in the finance system. Subscriber stations (generally based on teletypes) are set up in the rayon unit (in divisions of the State Bank). In many oblasts, these stations are connected by communication channels to the computer center of the oblast office. All information on negotiable instruments arriving at the bank departments is input by the subscriber stations to a computer located in the oblast (kray, ASSR) center. The results of calculations in the form of computer printouts are delivered to the departments, generally by courier or by mail (because of inadequate traffic capacity of the channels). It should be noted that processing of negotiable instruments of the State Bank is centralized on the oblast level not only due to considerations of reducing the cost of the hardware base, but also because about

50 percent of the payments go to departments from enterprises and organizations located outside of the rayon. Processing at the computer center of the oblast office permits these interbranch circulations to be made very quickly. Decentralization of processing on the rayon level while retaining data transmission to the oblast center would complicate the communication system, as well as the technology and software of tasks.

The interaction of financial and bank agencies in the RSFSR (research, planning and operation of the corresponding sets of tasks) has shown that there is a good outlook for organizing daily accounting and analysis of the arrival of State income in finance agencies based on information of the State Bank obtained from computer centers of oblast offices on machine-readable media. Doing this accounting on the oblast level allows attainment of qualitatively new results in the work of financial agencies.

First of all, the oblast financial administration receives a detailed analysis of the arrival of income, and an estimate of the anticipated fulfillment of the quota each day. The analysis is provided in the cross section of territories and sectors, and when requested, in the cross section of individual paying parties. Secondly, delays are planned in the arrival of accounting data, and accordingly in the compilation of reports for the financial agency of the oblast unit.

As a result, oblast agencies can get exhaustive information about the addition of monies to the budget, enabling them to make optimum managerial decisions within their competence. Moreover, concentration of analysis data on the oblast level will be of assistance in timely detection of both positive and negative trends in economic processes throughout the region so that the rayon unit can be oriented to eliminate detrimental effects. In this way, rayon financial departments will have more time for economic control operations, which they can make more goal-directed and specific.

Diagram 4 indicates the basic functions performed by a financial agency in the given version of interaction. The double line denotes monitoring and control functions performed without the aid of computers. Rayon financial departments work with computers only on those functions involving supervision and planning of the activity of economic objects. Data of analysis and forecasting of acquisitions by income sources immediately reveal troubled enterprises that should be given consideration. Upon request, the financial department receives a detailed picture of the dynamics of their personal accounts.

Mention should be made of one more aspect of integrated processing of financial department information. In this approach, the stage of gathering and processing rayon data for reports with respect to the oblast is omitted. Accounts can be obtained at any time with no more than a day's delay. This will shorten the time for reports to reach higher levels as well.

Thus, the second direction in automating data processing in rayon financial departments leads to the following results: information is processed on the computers of the financial agencies of the oblast unit; communication equipment is installed in the rayon financial departments that is connected by a telephone

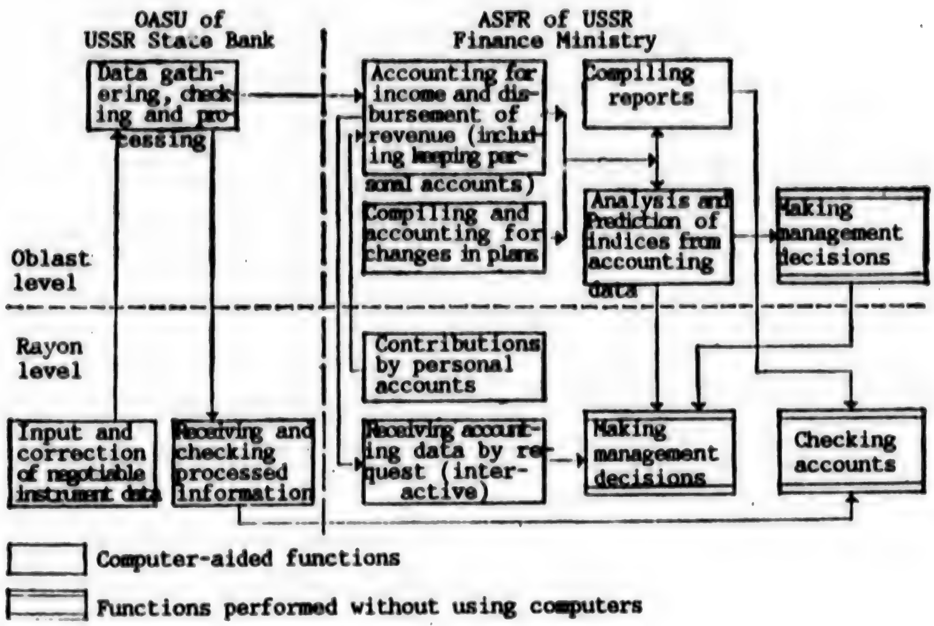

Diagram 4

Distribution of functions of finance-credit agencies by levels
with central processing in oblast unit

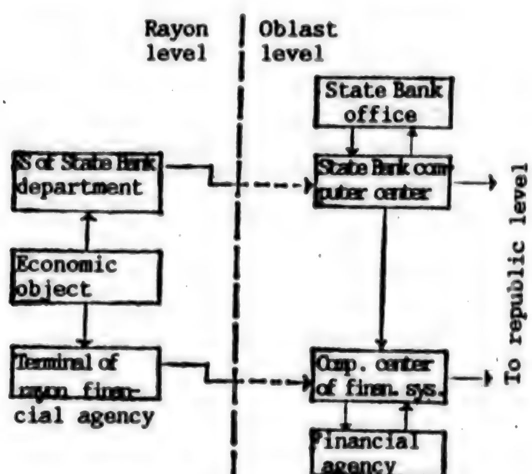

Diagram 5

Structure of hardware complex of rayon and oblast unit
with centralized processing

or telegraph channel to a computer (Diagram 5); a communication terminal in the rayon financial department transfers information about budgetary contributions and requests to the computers of the oblast financial administration; information may be output from the computer to this terminal about the status of personal accounts of paying parties; these accounts are kept in the machine on

the basis of bank data obtained daily from the computer center of the oblast office. Naturally, the official at the rayon financial department must work on an interactive basis with the computer, using communication facilities. The estimated cost of installing communication terminals in all 63 rayons of Gorkiy Oblast is about 150,000 rubles.

By early 1985, this approach to organizing interaction had been experimentally checked out in financial agencies and institutions of Gorkiy Oblast State Bank (since 1982), and Krasnodar State Bank (since 1983). The technology and program developed for Gorkiy Oblast were transferred to the financial administration of Donetsk Oblast. All financial agencies unanimously acknowledge the high efficacy of this method. It is being further developed by expansion of the indices obtained from the OASU of the State Bank.

The communications equipment is to go through several stages in its development. At first, it may be teletype apparatus costing about 1,500 rubles, and this equipment will then give way to subscriber stations with a higher exchange speed. The organization of communication channels will also undergo evolutionary changes. Telegraph channels will be replaced by telephone channels that can be used conjointly by financial and banking agencies for the sake of reducing cost.

Analysis of the two directions of automation shows that they complement each other. Setting up a finance-credit agency data processing complex in the rayon (decentralized processing) will allow studies and experimental validation of technology, and then, when duplication of effort has been eliminated, will maximize technological efficacy. As a result, an optimum technological model of interaction of finance-credit agencies can be constructed. Practical use can be made of this model after industry begins to produce minicomputers in sufficient quantity that are more compact, reliable, and less expensive than the SM-1600.

It should be noted that the first direction of development of the ASFR covers a wider range of users, and in particular, State Bank inspectorates and savings banks that are not yet participating in the second direction. At the same time, the use of the general technical and information base makes stringent demands on coordination in the development of each of the systems. Moreover, the installation of computers in rayons will require additional specialists for servicing and repair.

At the present time, with the available material resources, and especially the labor resources, computer calculations and communication with banking agencies must be handled on the oblast level, installing only communications equipment in rayons. Within a short period, this will considerably alter work of financial agencies of the oblast and rayon unit, and will have a great practical effect. As computers and communications equipment are improved and become less expensive, this direction will enable realization of the optimum model of interaction, which by that time will be based on a decentralized processing complex.

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DEVELOPMENT OF INTEGRATED SYSTEM FOR PROCESSING INFORMATION OF FINANCE-CREDIT AGENCIES IN RAYON

Moscow FINANSY SSSR in Russian No 5, May 86 pp 62-64

[Article by M. A. Syrg, docent, Tartu State University, and V. A. Tann, director, computing and data processing center, ESSR Ministry of Finance]

[Text] One source for accelerating scientific-technical progress and improving the efficiency of using facilities of computer technology, automated management systems, and automated information processing systems is their integration, i. e., simultaneous or coordinated solution of certain problems of the development and operation of several automated systems that are similar in their properties. The finance-credit agencies (FKO's) of the nation are looking for opportunities to integrate automated information processing systems and automated management systems on all levels (national, republic and rayon). The Estonian SSR has been commissioned to look at these matters on the rayon level.

A computer-based unified center for machine processing of information has been set up in Tartu Rayon of our republic for all FKO's of the region. The inter-agency data processing center (TsOD) replaces already existing or planned agency computing and data processing centers. Clients of the integrated system for processing information of finance-credit agencies (ISOI FKO) are the USSR Ministry of Finance, USSR State Bank, and the All-Union Bank for Financing Capital Investments of the USSR. The computing and data processing center of the Estonian SSR Ministry of Finance has become the head organization on development of the given system.

Work on development of ISOI FKO started in 1[illegible]. The system is being set up in three phases: starting complex, first phase, and the system as a whole. Consequently, developmental work will be continuing in the Twelfth Five-Year Plan as well.

Originally, the purpose of the ISOI FKO project for the region was to provide users of the system with information necessary for making management decisions, rational distribution of information among the FKO's of the republic and rayon levels, and within the system -- to increase reliability and efficacy of utilization for handling the problems of finance-credit agencies. The ISOI FKO of the region was to provide informational-functional communication with higher agencies, between itself and the external environment to handle FKO problems on

the basis of comprehensive utilization of the facilities of computer technology and communications, methods of mathematical economics and informational databases. Upon a more in-depth investigation of the problem, we came to the conclusion that these goals are too general: they can be achieved both in the ISOI and in agency automated management systems. Hence, what we need is a system to provide what cannot be attained in agency information processing systems for the FKO's of the region. In our view, such a goal is a reduction in the volume of information to be processed as a whole, and elimination of the duplication of effort with processing in other FKO's by concentration in a single TsOD.

In the course of development of the starting complex of the ISOI FKO of the region, a simultaneous check was made on integration plan decisions relating mainly to the supportive part of the system. The functions of individual FKO's are basically retained in the present projects. In particular, on the first stage of development of the ISOI FKO of the region it is planned to integrate:

a general-purpose data bank, i. e., data that are common to at least two FKO's, data that are exchanged between FKO's, information on all FKO's that is transmitted to the republic level, a unified database management system;

system software;

information processing hardware (development and operation of a unified TsOD);

data processing technology in the TsOD and unified working principles for the user (FKO worker) in the interactive mode with the display;

information processing personnel.

These integration problems are to be validated on the following tasks of the starting complex: working day of the State Bank (analytical and synthetic bookkeeping, memo circulation, mass transactions of the USSR State budget, compilation of statistical reports); working day of the Construction Bank (daily bookkeeping operations of the bank, compiling reports about fulfillment of the funding quota); operations on collecting deposits of State worker savings banks; estimating and accounting for property insurance premium payments, accounting for payment of all insurance premiums in State insurance inspectorates; estimating and accounting for payments from the populace, and compiling a report on these payments for the financial department.

It is no accident that Tartu Rayon has been the place for testing ISOI FKO. There are dual motives for such a choice. First of all, there is a department of the Construction Bank in this rayon, as in no other rayon of the republic. It is an object of moderate complexity, i. e., a city of republic jurisdiction without rayon division is located here, there is a rural rayon, there is one financial department apiece for the city and the rayon, and there is a State Insurance inspectorate. The second important reason is that there is a university in the city. Tartu State University is the only higher educational institution in the republic that provides training of personnel in finance and credit. Moreover, it graduates specialists on economic cybernetics and applied

mathematics. Tartu FKO's are permanent bases of practice for students, and the workers in finance-credit agencies give lectures on special disciplines. Consequently, it is easier to train personnel here for other rayons as well with orientation toward work under ISOI FKO conditions. Department specialists of the university are taking part in the process of ISOI FKO planning, especially in the elaboration of theoretical issues.

Criteria of efficacy are quite decisive for the functional structure of the ISOI FKO on the rayon level. In our view, the most important criteria are as follows: reducing expenditures in comparison with the creation of agency FKO automated management systems on the rayon level; reducing the volume of information to be processed and eliminating duplication of effort in processing; increasing the volume of output information without increasing the amount of initial data by integrating jobs; minimizing information and improving its quality; speeding up information processing; reducing labor inputs on processing the continually increasing volumes of information; ensuring rational loading of FKO workers and hardware, reducing peak loads; retaining and improving the functional interrelations with higher agencies, their agency-wide automated management systems, and also the ambient environment; economy of operation of the ISOI FKO of the region; capability of putting this system into practice in other regions as well with minimum modification.

The designers of the functional structure of ISOI FKO are faced with certain requirements that delimit the options they have for solving these problems. On the one hand, projected tasks of ISOI FKO are selected with allowance for their conformity to the goals of the given system, while their hierarchy is determined by the degree of anticipated effectiveness of a given task. On the other hand, in planning each task, the technology for handling it must be selected for maximum effect.

For various objective reasons, it is not possible to plan and implement the ISOI FKO of the region in strict accord with the principles of its design sequence. We are not speaking of difficulties in the area of compiling algorithms and programs for solving problems, but of the things that influence the process of selecting tasks (determining their scope and hierarchy). The first factor is the nonuniform level of mechanization of information processing in individual FKO's before planning of the ISOI FKO of the region was started. For example, the "working day" had already been mechanized in the departments of the State Bank and Construction Bank, while the work in savings banks had to start from scratch. On the one hand, this was responsible for the lag in mechanizing the working day of the savings bank in the starting complex as compared with the State Bank and Construction Bank. On the other hand, automation of information processing in the latter institutions had been oriented toward agency automated management systems. Considering the outlook for joining the regional system to the republic ISOI FKO, it would seem unreasonable to exclude tasks that are unnecessary for other FKO's in the starting complex.

Another factor is that planning of the ISOI FKO of the region is going on in parallel in four organizations: in the computer center of the republic office of the USSR State Bank for the Tartu Department of the State Bank, in the regional computer center of the republic office of the USSR Construction Bank of

Tartu Department of the Construction Bank, in the computing and data processing center of the ESSR Finance Ministry for city and rayon financial departments, the city and rayon inspectorate of state insurance in VNIINS [not further identified] for the central savings bank. The load is higher for all planners who would have to start from scratch, and the allocated resources do not correspond to the job volumes. Considering this, it is clear that on the initial stage of operation of the starting complex, the scope of automated data processing in departments of the State Bank and Construction Bank will be greater than in other FKO's of the republic. A third factor is the difference in numerical strength of individual FKO's of the region. There is one agency of the State Bank and Construction Bank in the region, while the Finance Ministry and State Insurance have two (separate ones for the city and the rayon), and the system of savings banks encompasses the central savings bank with jurisdiction over 9 first-class banks, 11 second-class banks, and 24 service banks scattered over the entire rayon.

A fourth factor is the existing functional obligations of the FKO's of the region, that correspond to different principles of agency-wide automated control systems of the FKO's that had arisen before ISOI FKO was planned, and do not allow for its capabilities and requirements. Therefore, along with the selection of equipment and tasks, compilation of programs and algorithms, it is necessary to surmount agency barriers, to simultaneously solve legislative, financial, staff and other problems that arise when adapting the FKO to the conditions of operation of the ISOI FKO of the region. In this context, one should also take consideration of the need for retaining former functional relations with higher agencies and with other regions that are still operating mainly on the old basis.

Of course, there are other problems that we have not mentioned, but this does not mean that the principle of sequence should be ignored in ISOI FKO planning. The principle can be temporarily departed from to speed up the planning process and shorten the time for introducing the system with allowance for situations that come up. At the present time in the Tartu Region there is a TsOD (as a division of the computing and data processing center of the ESSR Finance Ministry), an SM-1600 computer and other necessary hardware have been put into service, work is being done on preparing the FKO's of the region for experimental service, and finalization of the starting complex has begun. Completion of work on experimental service and finalizing the starting complex of the system for industrial operation is planned for 1986.

During the Twelfth Five-Year Plan, the ISOI FKO of the Tartu Region will develop in three directions: expansion of the range of functional problems to be solved, introduction of design developments on subsequent projects, upgrading of system-wide design features and expansion of the degree of integration. In this context it should be borne in mind that it is necessary to equalize the level of automation in all FKO's of the region and to increase the efficacy of the system as a whole. This is also required of us by the resolutions of the Twenty-Seventh Party Congress that are directed toward speeding up scientific-technical progress and putting computer technology to better use.

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DIFFICULTIES IN COMPUTER INTRODUCTION AT TIRE PLANT

Kiev PRAVDA UKRAINY in Russian 16 Apr 86 p 2?

[Article by A. Maslov, special correspondent: "Computer Illiteracy"]

[Text] "Electronics... by the Spoonful", this was the title of the material published in PRAVDA UKRAINY on 10 July 1985. It was about how, 6 years ago, an automated technological process control system costing more than 1 million rubles was introduced at the Tire Repair Plant in Brovary. However, the collective has not received a single ruble in return. The article was then answered by N. Voloshin, deputy minister of UkSSR [Minavtotrans] Motor Vehicle Transportation. He said that UkSSR Minavtotrans managers were taking a number of measures to assure the system's normal functioning. These include: the transfer of the computer system's technical servicing and operation to a specialized organization -- the Kiev Branch Information-Computer Center, the elimination of technical shortcomings in local automation, and increasing operations to 25 vulcanizers by the year's end. A check on the procedure whereby several workers at the plant were released did not reveal any violations of labor discipline. For delaying the preparation of the vulcanization section for industrial operation with the ASU TP [Automated system for the control of technological processes] ordered by the Ukravtoremont [Ukrainian Motor Vehicle Repair Association], the chief engineer V. But was reprimanded, but the director, Ye. Kruglik, was rebuked.

We did not hurry with publishing the Ministry's comments. Time should have answered a number of the fundamental questions, including: were the measures taken by the sector staff effective, and how well based were the reproaches addressed to the system's creators.

Recall that the reproaches were more than serious. The ASU TP's developers were faulted for the system' imperfections and gross errors in its programs. When asked about returns from expensive electronic equipment, Ye. Kruglik, the Tire Repair Plant director, the Ministry, the Ukravtoremont Production Association and the Brovary City Committee always answered pathetically: "We do not need such a system." Logical emphasis was prudently put upon "such" rather than "system." Enterprise managers believed it. However, it is much easier to believe words than to thoroughly check out something. This is what the article "Electronics... by the Spoonful" directed attention to.

Incidentally it was not only this newspaper. Even before the article's publication, a group of associates at the Kiev Institute for Automation (led by D. Shpakovskaya, candidate of technical sciences), understood the reasons for the many years' delay in introducing the computer system and came to the unequivocable conclusion: there was an unsuitable approach to the system's introduction. In order for electronics to give a real return it was necessary, in the specialists' opinion, to put the machinery and local automation in order, eliminate slovenliness and theft at the enterprise, change the system for paying machinery operators, review the job descriptions of many engineering-technical workers, etc. To say the least, plant managers were unenthusiastic about these conclusions. They were ignored completely.

And not only at the plant. The Brovary City Party Committee did not give the specialists' opinion the attention it needed. Persistently and admirably, workers at the gorkom carefully attempted to fathom deep technical details, while at the same time, the ASU collective was, so to speak, falling to ruin before their eyes. The Party gorkom did not react at all to the publication itself. A meeting of communists at the plant, which discussed the article, gave no basic evaluation either. The meeting should have done this. After all, plant managers, attempting to justify their position with regard to the ASU Department, announced to all who would listen, that the author of the article "used the information of informers." After this announcement, it is not without irony that one hears the statement by A. Dzyuby, a communist and electric power supply worker at the plant, who has no relationship at all to electronic equipment: "Although I did not read the article, it is too early to introduce an ASU at the plant."

Fortunately, not all statements by enterprise communists were at that level. For example, N. Prosin, a communist with almost 50 years service, gave an accurate evaluation of management's actions and the history of the system's introduction. The experienced electronics engineer said frankly that such a long introduction time is the result of the plant management's inert attitude towards innovation and unwillingness to put production into the needed order. Nikolay Vasilevich Prosin, chairman of a people's control group, expressed his opinion to the management at UkSSR Minavtotrans. His letter to the ministry stated that several months after the article in PRAVDA UKRAINY little had changed. The psychological barrier to the production introduction of electronic technology had not been overcome.

"Computer illiteracy" is a new, more accurate name for this "psychological barrier." This involves unit managers and economists not even having an idea about the potentials and methods for computer use in practical work. This is the situation at the Brovary Plant. In one of our discussions with Ye. Kruglik we asked where and when he had studied the practical use of computers. It turned out that he had not studied it.

However, lack of knowledge about electronic equipment's potentials and lack of ability to use them is not no much a fault of Ye. Kruglik as it is a misfortune. This situation should have been foreseen at the Ministry when it was decided to equip the Brovary Plant with a computer system. It should have also been concerned about training specialists. However, apparently V. Reva, the deputy minister, was more concerned about how to more advantageously

display the system at the VDNKh UkSSR [Exhibition of Achievements in the Ukrainian SSR Economy], than in organizing such training. This yielded its bitter fruits. As a matter of fact, the Ministry had to be compelled to transfer the ASU TP Department to the Kiev Branch Information-Computer Center.

It is a strange situation: a department specially created to service production is not subordinate to the plant. However, this compulsory measure immediately improved the morale situation at the collective servicing the system. This is additional evidence of the attitude towards electronics at the enterprise. The replacement of P. Kozarenko, department manager, also made for a healthier morale climate. It was his direct fault that several specialists left the plant or were released. The newspaper, pointing to this, hoped that the reasons for the people leaving the enterprise will be discovered and analyzed. The Ministry restricted itself to the statement: violations of labor discipline were not discovered.

Some things should have been seriously contemplated. Take, for example, the treatment of A. Zaytsev, the first manager of the ASU Department, who has given the plant almost 10 years. Several lines in the article, devoted to this undoubtedly gifted engineer, caused a sharply negative reaction among some communists at the enterprise.

At our request, workers at the Ukravtoremont Association prepared two corrections. The first of them contained evidence that during the five-year plan the collective at the Brovary Tire Repair Plant obtained 15 inventors certificates for inventions, 2 of which were put to use in production. The other correction affirmed that A. Zaytsev was the inventor of all these. These inventions made up one-half of all those made by the entire Ukravtoremont Association during the five-year plan. The claims about the low value of the inventor's innovations were also groundless: they included some which were acknowledged by foreign firms specializing in tire repair. Nevertheless the introduction rate is very low. One of the inventions -- a device for applying a protector (Author's Certificates No. 828564, 774086, 1040724, 1047058, 11021164) spent several years moving from test to test.

As far as relatives included in the certificate are concerned, the Ukrsovet VOIR [All-Union Society of Inventors and Innovators] told us that this produced no benefits for the inventor. If one so desires, this could be viewed as a unique protest against the common practice of including as inventors people capable of "assisting" an invention's introduction. After all, if they are not included one might hear a courteous reply: our idea is still new, we have no potentials, something similar is around somewhere, it found no use. Or, the enterprise's base does not permit it, there are no specialists who could evaluate it...

It is even more vexing to hear this in one's own collective, running up against the wall of indifference, incomprehension and blind resistance. I. Usatenko, chief of the plant's technical department, openly stated his position on this: "I was tired of working for Zaytsev." Irina Ivanovna also had a few ideas, but did not have the time to give them form and did not feel it necessary to do this.

However, Zaytsev did find time. Three years ago, done out and run down, he transferred to the Ukoopproyekt [not further identified] Institute. Judging from everything, he is valued there. In the past two years A. Zaytsev has obtained two more inventor's certificates. One of the innovations was awarded a Gold Medal from the USSR VDNKh and the other an award from the UkSSR VDNKh. Both have been introduced into production. Neither were involved with tire repair.

Possibly, Zaytsev's personality and creativity are uninteresting to the UkSSR Minavtotrans. Perhaps, they are even unsympathetic. However, even the respected Ministry is concerned with a problem pointed out at the 27th CPSU Congress -- increasing tire service life. A. Zaytsev, an honored inventor in the UkSSR, proposed specific solutions for this.

The computer system has been accepted for regular operation. Forty seven out of 60 vulcanizers have been put under computer control, but only 12-15 are actually working per shift.

L. Svirenko, party organization secretary at the plant and worker in the OTK [Department of Technical Control], said, "Tires produced with the help of electronics are much higher quality than those produced manually. They require practically no monitoring.

This opinion needs no comment.

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COMPUTERIZED CROP INFORMATION IN MOSCOW OBLAST

Moscow LENINSKOYE ZNAMYA in Russian 16 Aug 86 p 1

[Article by Ye. Grigoryev, candidate of Agricultural Sciences, director, Information-Computer Center for the Chemicalization of Agriculture: "Computer for the Agronomist, Agronomist for the Computer"]

[Text] Every year there is a day in which is an important event for agronomists: plant growth begins. On all fields (first of all winter crops) an "automated system" is turned on -- this is the totality of green plants making up a crop.

Every day, hour and second the program in a plant's genetic apparatus controls a technology for the formation of organic structures which, in the final account, are transformed into the harvest. At each stage in plant development this program requires a specific combination of heat, light, moisture and nutrients.

The maximum yields are obtained where all this is observed. What seems to be the secret?

A very diverse set of forces and circumstances influence crops: Weather, the course of meteorological processes, field characteristics -- soil acidity, content of nitrogen, phosphorous, potassium, manganese, boron, molybdenum, boron, and other nutrients, soil agrophysical properties, field history, predecessors, yields and biological features, the level and nature of weed infestation, the phytosanitary situation -- diseases, pests, rodents.

All these are constantly developing and interacting. True, plant breeders have created crop varieties which "work" with sufficient reliability under such conditions.

However, reliability is a relative concept. Specialists are confident that many varieties' potential is considerably higher than now being realized. The principles and methods of intensive technology for grain growing are directed towards the maximum use of this potential. There is no need to give a detailed account of this technology -- practically all agronomists in the oblast have taken courses on its use. We would like to direct attention to the fact that, when managing intensive technology, specialists use information -- on crop,

weather and field conditions and work results. This information should be at least 5-6 days ahead of plant development.

It is necessary that each "brain" see and foresee crop conditions in general and during that time provide specific information (inquiries, recommendations, drafts for agronomic decisions, technological cards, etc.) for each field. Any agronomist should obtain answers to his questions.

The creation of an "agrochemical brain" in the oblast has begun. The Oblast Station for Chemicalization and the Computer Center for the Chemicalization of Agriculture have formed an automated data bank for kolkhoz and sovkhoz fields. This has already been written about.

It is now necessary to link this bank up to daily agronomic work. This task has been posed and requires direct participation by farm agronomists.

It is proposed to begin it by accepting applications from farm specialists requesting to participate in "teaching" computers agronomic work methods. This requires active, interested participation by agronomists, agrochemists and plant protection specialists experienced in agronomic decision making at specific farms. We also invite young specialists desiring to more quickly become acquainted with this experience to participate in our program.

The final goal of these actions is to equip farm specialists' workplaces with personal computers linked to a central agronomic information bank and capable of helping specialists make effective decisions in the optimal use of available resources.

Those wishing to participate in this work are asked to report this to: 143013 Moscow Oblast, Odintsovskiy Rayon, Nemchinkovka, Ul. Agrokhimikov 6, Moscow Oblast Design-Research Station for Chemicalization, Computer Center.

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FLEXIBLE SYSTEM FOR GATHERING, STORING AND PROCESSING ORGANIZATIONAL-ECONOMIC INFORMATION BASED ON YeS EVM COMPUTER

Moscow ENERGETIK in Russian No 6, Jun 86 pp 25-26

[Article by V. Ya. Korshak and O. N. Ivanov, engineers, Kolenergo]

[Text] The dynamism of organizational-economic management, frequent changes of input and output information, diversity of applied forms of cost accounting and economic analysis are creating serious difficulties for effective introduction of computers. The adjustment of programs to a rigid processing algorithm, and the form of input and output information lead to rapid obsolescence of software. However, the developments that are incorporated into organizational-economic management do not always have sufficient flexibility of software and informational support, that excludes modification of the main program when there is a change in the informational requirements of the management apparatus.

The deficiencies of "rigid" programs are most obvious where user requirements are not limited to automation of accounting and report operations. Computers can be used to advantage in automating analytical calculations.

Programmers are the intermediary for communication between specialists and computers. This not only increases the cost of utilizing developments and reduces the technological value of the processing algorithms that are used, but also appreciably complicates the automation process.

In connection with this, the department of automated management systems of Kolenergo [not further identified] has developed a flexible system that is now in commercial use for gathering, storing and processing organizational-economic information. The basic principles of design of the system are:

information is prepared directly from primary documents 3 without setting up intermediate models (see figure). Input documents are automatically standardized upon input to the computer;

the basis of standardization of documents is reference 2 that contains a set of rules for standardized entry with respect to forms of documents 1;

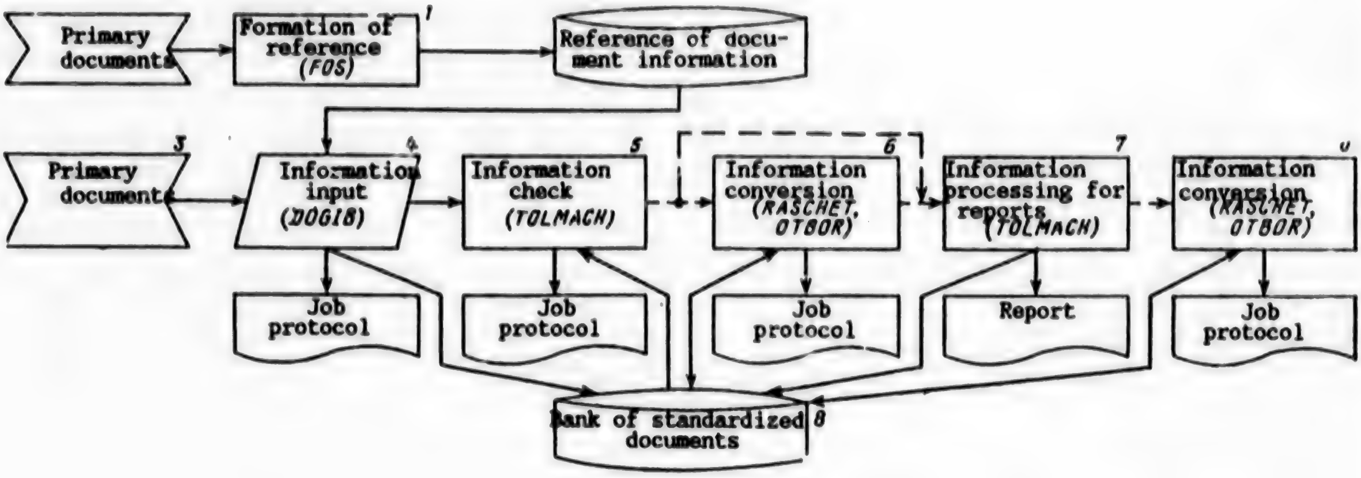

Diagram of operation of primary document bank

data are input to the bank in accordance with reference 4. When the document does not conform to the reference, a message is output without entry in the bank;

the algorithm for data processing by the TOLMACH program 5 that verifies information for logical correctness and conformity to the directive economic documents is created in the monitoring and review module;

the TOLMACH program enables processing of documents in accordance with specifications of the technologist 7, and produces output forms according to arbitrary orders. Assignments on information processing via the TOLMACH program contain arithmetic and logic combinations with the requisites of standardized entries, as well as a description of the output form. Making changes in the algorithm for processing specific assignments has no effect on operation of other modules;

the RASCHET and OTBOR programs 6 allow accumulation of on-line information for the report period, transfer of information from one document to others, elimination of outdated or unnecessary documents, and coding of information for transfer to the upper level;

assignments on database processing by the TOLMACH, RASCHET and OTBOR programs contain the same arithmetic and logic operations with requisites of standardized entries;

EKONOM bank 8 (as many as 100,000 documents) takes up one YeS-5061 disk. Magnetic tapes are used only for copying information from the disk. The software package is written in PL/1 in the YeS operating system. Changes in the placement and number of requisites of the primary document are accounted for in the standardization reference.

When there is a change in the method of calculation or the form of output documents, corrections are made in the algorithms for processing the corresponding assignments. Labor expenditures are not appreciable, even for radical alteration of an application-specific functional task.

The EKONOM bank enables distribution of information by individual files, increasing the speed of processing. Merging of information of different files is done by the OTBOR program, enabling simpler restructuring of decentralized information processing to a complex system. Files can also be combined as the results of each file are individually summarized.

A specific feature of the EKONOM bank is effective monitoring of input and output information. Use of the monitoring and review module enables on-line detection and elimination of errors of the operator and technologist, as well as ensuring error-free accounting and reporting.

Monitoring cuts down on inputs for data preparation during the process of incorporation and operation of application-specific tasks of the EKONOM bank. This is especially appreciable when processing large information files in limited periods.

For example, processing of driver trip tickets, which includes norms of fuel consumption, compilation of reports on fuel description by grades and codes of production expenditures, calculation of the driver bonus for fuel economy, and calculation of depreciation deductions, requires high accuracy of information with respect to nearly all input requisites of each trip ticket. Therefore, the monitoring and review module is very important in the the set of tasks on fuel accounting and analysis of transport operation.

In the set of tasks on accounting for fixed capital, computer-aided review of inventory card information eliminates departures in the norms of depreciation deductions and codes of production expenditures.

Flexible processing of economic information considerably reduces expenditures on introduction and expands the range of application of machine processing. As already noted, the system can operate with an arbitrary set of economic documents. However, the advantages of flexible systems are most clearly evident in processing of complex data files that are subject to frequent changes, including primarily socioeconomic information.

In 1984, the department of automated management systems of Kolenergo developed and introduced a set of specific tasks: "Labor, Personnel, Wages." The local data bank for this task set is based on personal dossiers integrating all necessary information for the needs of bookkeeping, and divisions of labor, personnel, reliability service and accident prevention.

In the personal dossier, provisions are made for systematizing, accumulating, storing and primary processing of information. In this way, it only remains for the user to specify the precise mode of final processing to get the output document.

Moreover, provisions are made for expanding the personal dossier without altering the fundamental program by input of additional requisites and in-depth detailing of qualitative features of existing requisites. In this context, a monitoring and revision module has been developed that ensures high reliability of information, appreciably exceeding its quality in conventional systems without computers.

In addition to the enumerated summaries of various kinds involving computations of wage payment and distribution in accordance with analytical calculations, the output information of this complex provides multivariate and multiple-address information for the needs of reporting, analytical and planning jobs, for supervising and managing social problems within the power system. The comprehensiveness of accounting and data processing brings about important prerequisites for in-depth generalizing studies in the area of wage payment and social processes.

However, the potential capabilities of flexible systems of processing economic information can be realized only if users are interested in upgrading working methods. Therefore, with the introduction of these systems there is still more of an increase in the significance of improving planning, cost accounting and organizational structure.

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METHOD OF DETERMINING ECONOMIC EFFECT FROM AUTOMATION OF PRODUCTION CONTROL

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 3, Mar 86 pp 8-10

[Article by R.I. Zabotina, candidate of economic sciences]

[Text] Under the present conditions of economic development, one of the main factors for increasing the effectiveness of national production is its automation and the use of computers (VT) and microprocessor equipment. However, the methodological materials which are presently used for determining the economic effectiveness of automated control systems by enterprises and production associations do not contain recommendations on the methods of calculating the economic effect from the automation of control as a component part of final actual results of the operation of an enterprise. Due to this, in statistical reports (forms No 2 NT and 10 NT) of many enterprises, the values of the actual increment of profit, decrease of production cost, and the annual economic effect from the introduction of automated control systems and computers do not correspond to the value of the actual decrease in the norms of the expenditures of labor and material resources. The actual effect is identified with the planned effect.

The Institute of Economics of Industry of the Ukrainian SSR Academy of Sciences has developed a method for determining the actual economic effect from the automation of production control. Its essence is as follows.

Under the conditions of production intensification, important results of management and its development are: economical use of labor and material resources in production, ensuring a faster pace of the output of products than the labor and material expenditures. Therefore, the methods for evaluating the economic effectiveness of control automation are based on its measuring as a result of the lowering of the norms of labor and material expenditures on the manufacturing of products put out by the enterprise.

The actual economic effect from the introduction of ASU [automated control system] and VT in the profit and loss accounting is defined as a component part of profit-and-loss results of the activities of the enterprise or the production association during a specific report period and is characterized by a system of indexes. The actual increment of the enterprise's profit obtained as a result of the implementation of a particular measure is used as a generalizing index. In order to determine it, it is necessary, first of all, to calculate such individual indexes as the decrease in the labor input in the manufacturing

of the product, the decrease in the expenditures of materials, fuel and other resources for the manufacturing of the product, and then the increase in the volume of production and the decrease in the cost of the product.

The economic record of the measure serves as the informational basis for such calculations. It includes the entire initial information (regarding changes in the norms of the expenditures on production), as well the information on the results: regarding changes in the economic indexes of the operation of the enterprise resulting from the implementation of a given measure. Files of this information are formed in the computer memory. They contain information regarding the overall economic effect of each measure, showing savings in direct and indirect expenditures on production separately*. All of the necessary calculations and systematization of data connected with maintaining the records of measures are done by the computer center. Functional departments of the enterprise management, including the planning and norm setting departments, analyze and use this information for substantiating their decisions.

Studies have shown that not all measures connected with the introduction of ASU and VT ensure the achievement of an economic effect by lowering technological labor intensity, changes in the norms of material expenditures on the manufacturing of the products or reducing the size of the management personnel. In this case, it is necessary to determine the savings achieved through a relative reduction of expenses on the management of the enterprise, shop or section where a given measure was implemented. This can be computed by comparing the levels of actual and normative expenditures on the management of a given subdivision during the period being analyzed. For a normative level, it is expedient to take the level of expenditures (actual or planned, according to the purpose of analysis) in the year preceding the beginning of the five-year period being analyzed. Calculations are done by the formula

$$\pm \Delta З_{у.ф_i} = З_{у.ф_i} - З_{у.н_i},$$

where $\pm\Delta З_{у.ф_i}$ is the actual change in the management expenditures in the i-th year, thousand rubles; $З_{у.ф_i}$ and $З_{у.н_i}$ are total actual expenditures on management and those taken as normative in the i-th year, fractions of one:

$$З_{у.ф_i} = (З_{уп} + E_н K_у)_{ф_i},$$

$$З_{у.н_i} = \frac{(З_{уп} + E_н K_у)_0}{ТП_0}\, ТП_{ф_i},$$

o and i -- indexes of the basic year and the analyzed year, respectively; $З_{уп}$ -- management expenditures, thousand rubles; $ТП_0$ and $ТП_{ф_i}$ -- output volume of products to be marketed in the basic and the i-th years, respectively, in comparable prices or in a standard net product, thousand rubles; $K_у$ -- total

*Chumachenko, N. G., and Zabotina, R. I. "Analiz ekonomicheskikh rezultatov ispolzovaniya vychislitelnoy tekhniki; Metodologiya i praktika" [Analysis of Economic Effect of Using Computers: Methodology and Practice], Moscow, Finansy i statistika, 1985, 152 pages.

capital investments in management improvement, thousand rubles: E_H -- coefficient of effectiveness of capital investments.

The change in the expenditures on management is a result of the overall improvement of management of a given object. In accordance with the "Methodological Instructions for the Development of State Plans of Economic and Social Development of the USSR" (Moscow, 1980), there are four basic directions for the optimization of management: improvement of the organizational structure, improvement of professional skills of the management personnel, improvement of the hardware of control systems, and improvement of management methods. All of them are organically interconnected, and the overall result of the optimization of management can be rightfully divided equally. If there are data substantiating the predominent influence of one of these directions, they should be taken into consideration.

Consequently, in the general case, the change in the expenses on management due to the introduction of VT in the i-th year $(\pm\Delta Э_{у.ф.вт_i})$ will constitute one fourth of the total change in the expenses on management improvement:

$$\pm \Delta Э_{у.ф.вт_i} = \pm \Delta Э_{у.ф_i} \cdot 0{,}25.$$

If a measure for the introduction of VT includes a complex of functional problems, it is possible to isolate for each of them (in proportion to the expenses) an approximate amount of the actual economic effect.

Tests of the above method at Donbass [Donets Basin] enterprises which introduced ASUP [automated enterprise management systems] and ASUTP [automated system for the control of technological processes and production] showed that its use makes it possible to determine quantitative values of the actual economic effect from management automation as a component part of the obtained results of the enterprise's operation, to make the calculation of savings in labor and material expenses on production more accurate and, thus, to contribute to the solving of problems of the intensification of production and increase in its effectiveness.

10233
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AUTOMATED SYSTEM FOR CHECKING EXECUTION OF DOCUMENTS

Kiev TEKHNOLOGIYA I ORGANIZATSIYA PROIZVODSTVA in Russian No 2, Feb 86 pp 11-12

[Article by V. G. Shipitsyn, I. P. Lagno and G. V. Shevchenko, engineers]

[Text] An automated system for checking execution of documents (ASKI) has been developed at NIIPTmash (Kramatorsk). The basic job of the system is to improve executory discipline, and ensure timely execution of documents (orders, regulations, decisions, job schedules, and so on).

The users of the system are subdivided into executives, checkers and control service. Each of these categories is provided with certain informational materials:

executives are provided with advance control notices (by the month and by the ten-day period), reminder cards three days in advance of the execution deadline, a list of unexecuted measures, an evaluation of promptness, diligence and accuracy of execution for the month;

checkers are provided with advance control notices on measures to be checked, on-line information about any document being checked, evaluation of promptness, diligence and accuracy of execution for the month;

the control service is provided with a summary evaluation of promptness, diligence and accuracy of execution by enterprise, data about the execution of documents, additional advisement concerning verification and validation of information being checked.

The ASKI system performs the following functions: preparing and checking copies of documents (creation of the main information file), setting up reference files, computation and output of spreadsheets. The latter operation is performed in several modes, depending on the period of computation: daily on-line check mode; weekly advance notice mode; monthly computation with output of data about unexecuted documents and evaluations with respect to each executive and checker; computation by request (about the status of execution of a given document).

The basic initial informational materials of the system -- the documents that are to be checked -- are entered in the journal of registration of input documents, or a supervisory accounting execution chart.

The system permits autonomous operation of several inspection groups at an enterprise when general main informational supervision is provided.

The directive documents that are checked by the system go through the following stages of processing: assignment for inspection (by the supervisor, who marks the document with the letter K, or by the director of the control service); entry of initial documents on blank forms (in the journal or supervisory accounting chart); primary validation of the initial documents and entry in the main information file of the system; processing in set modes while in the file; removal from the file and deletion of the initial document after execution and removal from inspection.

The operation of the system is supported by the control service, which transfers information to input documents, delivers this information to users, works with the initial documents as they are being checked, and corrects information of the main file in accordance with the corresponding instructions.

ASKI software has been developed for YeS EVM computers in PL/1 and ASSEMBLER. A DOS version of the system enables data input from punched tape or magnetic tape, using the GVV DOS application-specific program package or "Sekunda" software system, and a version in the OS operating system permits input from punched tape or magnetic tape, using the GVV OS application-specific program package.

ASKI is an aid to timely and accurate execution of supervisory documents, and consequently improves production efficiency. Introducing the system reduces expenditures on verification of execution.

The system is in operation at NIIPTmash, at Irkutsk Heavy Machinery Plant imeni V. V. Kuybyshev, at Slavyansk Heavy Machinery Plant imeni the Sixtieth Anniversary of the Great October Socialist Revolution, and at Lyudinovo Diesel Locomotive Construction Plant, and may be used at other enterprises and organizations of the sector. The introduction of ASKI has saved 10,000-20,000 rubles at each enterprise.

6610
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COMPUTERIZATION OF BUILDING DESIGN

Moscow STROITELNAYA GAZETA in Russian 10 Sep 86 p 3

[Article by R. Dichyus, director, Institute for the Design of Communal Operations: "Around the Computer"]

[Text] On the average, design work in the country is about 15 percent automated. This is mainly due to the automation of simple operations -- estimation, thermal engineering and design calculation.

Our institute is considered "unfavorable" for automation because it does not have objective specialization: We design housing (more than 1,500 designs annually), public buildings, the productive base for communal operations, and urban improvement work. Using thematic plans we prepare designs for remodeling old housing. We could have enough work for electronic helpers. However, from the first steps in computer introduction we encountered serious difficulties.

The first problem was the lack of a comprehensive approach to hardware and software for the automated design system (SAPR). We obtain a computer and the installation workers start it up. What next? It is necessary to turn to the Interbranch Fund of Algorithms and Programs for Automated Design Systems (MOFAP ASS). However the stock of programs is very small and some of them are obsolete.

We had to bow to program developers. It would seem that we could count upon qualified help. That was a misfortune -- another problem in the way: program developers were not interested in having them sent where they were needed. Although it is considered that our software is intended for industrial production, existing normative documents do not stimulate increases in such production. Isn't it strange that there is a "good" and demand for it, but it is not sold? This process is delayed by the lack of a countrywide unified price rate for the creation and delivery of programm products.

Our institute stumbled upon this problem back in 1980, when it acquired its first minicomputer in the SM [Small Machines] series. Having become certain of automation's promise, we continued on course and by the end of the 11th Five-Year Plan had 4 minicomputers and 25 terminals at designers work stations. On this equipment we used 45 program packages, including 38 we ourselves developed.

On our computers we calculate structural designs, ventilation and heating systems, automation devices and engineering utilities. Buildings are drawn from any perspective, making it possible for the architect to freely manipulate components, changing their location and selecting the optimal variant. The annual economic effect from computers' use is about 180,000 rubles. Our programs are now used by 70 design organizations in the country.

A Department for the Automation of Design Technology, employing 52 highly skilled specialists has been set up at the Institute. This Department, on cost accounting as an independent production collective with its own production plan, did 350,000 rubles worth of work this year.

Now that the path towards automation has been taken, the problems should be removed. On the contrary, they have deepened. A situation has been created where it is beneficial to have old computer hardware. Programs for it can be obtained, although with difficulty. Program development has not even begun for powerful new computers (computers of the type SM-1700, Electronika-82).

We will not move forward until problem application programs are put together, as previously, from individual design tasks. A SAPR should be built comprehensively, based upon a single digital model of the object. Increased attention should be paid to the automation of graphics work, making up more than half of designers' work load. Scientific research institutes should be solving this problem, but unfortunately, themes which are suitable for dissertations predominate there. The work on systems problems programming being introduced is poorly supported.

It is necessary to improve "electronic service." Existing departmental services for the centralized technical servicing of computers are very slow. For example, we had to wait two years to replace a guaranteed disk drive which had broken. Thus we have to maintain a staff of specialists capable of repairing computers and finding spare parts for them.

Finally, the status of the Automated Design Department. With respect to its staff description and associates' pay, financial organs usually equate it with a computer center. It is necessary to do all sorts of things to prove to them that a SAPR is not a unit in a computer center. The price structure for design work does not take into account the cost of computer assisted design. This is the origin of all misunderstandings. Existing price rates do not stimulate design organs to introduce variant designing or to optimize design solutions, even though everybody understands that only this way can one improve design quality, save materials and labor in construction and help reduce its cost.

11574
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SOFTWARE TOOLS FOR MACHINE-TOOL ATTACHMENT DESIGN

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 7, Jul 86 pp 29-31

[Article by Engineers E. B. Bokshits, V. V. Bukataya and R. I. Gerasimchik: "Use of Operating Systems and Applied Program Packages When Designing Machine-Tool Attachments"]

[Text] The necessity of increasing the efficiency with which computational processes are managed and of freeing programmers from the labor-intensive work associated with writing programs has resulted in the use of computer operating systems which simplify the work of the programmer and operator. Operating systems make available the extensive capabilities of programming languages and their corresponding compilers, provide convenient access to frequently used programs, plan work and monitor and detect errors.

Applied program packages have been developed at the Technical Cybernetics Institute of the BSSR Academy of Sciences for designing machine-tool attachments which form the basis of automated design systems for fixtures and other machine-tool attachments. All of the systems function on a YeS computer with DOS or OS operating system and utilize computer graphics hardware (drafting plotters of diverse design and system configuration).

The "Konduktor-2YeS" and "Konduktor-3" computer-assisted design systems for drilling fixtures, the "Tokar-1" and "Tokar-1M" turning and grinding operation fixture design systems, a system for designing jig turret press attachments and others have recommended themselves well in the radio-engineering, electrical-engineering, machine-building and instrument-engineering industries. The development of the "Frezer-1" computer-assisted design system (CAD) for designing milling jigs is being completed. The addressable memory of the CAD is about 8 megabytes, and 0.5-1.9 megabytes for the other mentioned systems.

Most CAD include "Input", "Synthesis", "Documentation", "Manufacturing Engineer" and "Manufacture" functional subsystem sets. (Footnote 1) (A. G. Rakovich and A. Samek: "Principles of Constructing and the Characteristics of Applied Program Packages for Designing Drilling Fixtures", in the book: "Computer Science of the Socialist Nations". Moscow: Finance and Statistics, 1981, Vol 9, pp 117-124. "Invariant Components of Automated Fixture-Design Systems," V. V. Adamchik, N. I. Vol..ova, L. V. Gubich et al. Edited by A. G. Rakovich. Minsk: Science and Engineering, 1980, 160 pp).

Machine-tool attachment design systems are constructed according to the following scheme. Data about the machined part and the machining diagram for a specified operation are entered into the computer. The computer-assisted design process begins with the implementation of a structural synthesis program that generates a data description of the fixture as a corresponding digital model. Control is transferred to a specification compiler and its results are outputed on the computer printer. Then a drafting program generation system is implemented. The generated programs control a drafting plotter as it produces detailed and assembly drawings of the design. The process is completed by the manufacturing design and NC machine-tool program preparation subsystem. As a result, a printer produces the requisite manufacturing documentation, generates information for the automated production control system, and a perforator produces an NC machine-tool control program for machining certain special parts of the fixture.

A description of the mentioned systems is given in the table.

Characteristics	"Konduktor-2"	"Konduktor-3"	"Tokar-1M"	"ASPOD-KRP"
Drafting plotter	"Istekan-2" "Istekan-4" YeS-7051 AP-7251Kh KPA-1200 YeS-7054	"Istekan-2" "Istekan-4" YeS-7051 YeS-7054 AP-7251	"Istekan-2" "Istekan-4" KPA-1200 YeS-7051 AP-7251	"Istekan-2" "Istekan-4" YeS-7051 YeS-7051
Computer software system	SMO DOS/YeS Versions 1.3, 2.0, 2.1, 2.2 OS/YeS Versions 4.1, 6.1	SMO DOS/YeS Versions 2.0, 2.1, 2.2 OS/YeS Versions 4.1, 6.1	SMO DOS/YeS Versions 2.0, 2.1, 2.2 OS/YeS Versions 4.1 6.1	SMO DOS/YeS Versions 2.0, 2.1, 2.2 OS/YeS Versions 4.1, 6.1
Drafting plotter software system	PAD-YeS	PAD-YeS	PAD-YeS	PAD-YeS
Programming language	Fortran-IV, Assembler	Fortran-IV, Assembler	Fortran-IV	Fortran IV, Assembler
System memory capacity (kilobytes)	1920	910	800	500
Average time to compute one task on the computer (min)	5	4	5	5
Drafting plotter drawing time (min)	30	30	30	20
Number of enterprises that have introduced the system	20	13	8	6

A large number of enterprises in this nation have now embraced the computer-assisted design of machine-tool fixtures. One can name as examples the Minsk Production Association for computer facilities, the "Gorizont" Production Association (Minsk), the "Belavtomaz" Production Association (Minsk), the Kirovsk Instrument Engineering Plant, the "Torgmash" Production Association (Kaliningrad), the "Elektroapparat" Plant (Rostov-na-Donu), polytechnical institutes in the cities of Tbilisi, Frunze, Sverdlovsk, Kiev and many others.

The fundamental components of the economic efficiency of fixture design automation are: Reduction of design labor-intensiveness, acceleration of the product manufacturing preparation processes, and better quality of the designs and the generated documentation. The introduction of CAD systems reduces the design labor-intensiveness by 10-12 times and design work costs by 8-10 times, while the level of standardization of the designs is elevated.

Modular programming and many components of the control and processing programs of the DOS YeS and OS YeS operating systems were used in the development of the applied program packages. Large program sets were decomposed (segmented) into smaller ones which were autonomously developed and then combined in order to increase programming efficiency. The obtained segments did not always coincide with the design function modules. The operating systems made it possible to program and debug the applied program packages in pieces using the ASSEMBLER and FORTRAN programming languages.

The program modules written in one of the input languages (source modules) were encoded on perforated cards and represented as direct-access volume library data set partitions under the control of the DOS YeS or OS YeS operating systems. The initial data library sets were comprised of the input data for systems application programs, in particular, the ASSEMBLER and FORTRAN compilers (Footnote 1) ("Methodological Instruction Materials for Using Drilling Fixture Design Programs Under OS YeS Control," E. B. Bokshits, N. I. Volkova, R. I. Gerasimchik et al. Minsk: BSSR Academy of Sciences Cybernetics Institute, 1983. 94 pp). The following operating system control programs were used: Booting program, the supervisor, job control program and the data control program. The operating system application programs used were the linkage editor, librarian, utility programs, autotest programs and compilers.

The experience acquired from programming computer-assisted design processes for machine-tool attachments promoted the need of developing a module interface that considers the peculiarities of the design process, the data base that contains the elementary design solutions on whose basis the automated synthesis of the designs is accomplished, the designs of the machined parts and other properties of the environment in which the machine-tool attachments function. This interface is now being utilized to construct a computational process that synthesizes structurally complex milling fixtures.

The computational model of the fixture structural synthesis process is a linear sequence of commands. The commands of the sequence reflect the man (designer) or machine execution of the planned operations. The dialogue constructed in this manner includes the statement of the design task to the designer by the machine, the display of the graphic and text representations of the task as a problem for

the designer, design decisions by the human being and their expression in a special textual and graphic language format on the display, and recording the results as a digital description of the design. The design results are stored in a direct-access (variable) data base. The principles used to model such data (Footnote 1) (G. V. Makhnach: "Standard Data Structures in Computer-Assisted Fixture Design Systems," in the book: "Algorithms for Designing Machine-Tool Fixtures and Tools." Minsk: BSSR Academy of Sciences Cybernetics Institute, 1984, pp 59-66) assume that the elements of the environment in which the fixture functions (machined part, tool, machine tool, etc.), the model and the functional structural elements of the fixtures (locating, guide and clamping elements) are uniformally described. Dynamic allocation of the computer memory is used for this purpose. The data structure corresponds to the natural articulation of the designs from components, assembly units, parts, and configuration elements (portions of surface members or groups of surfaces).

Data control procedures and language facilities for accessing them were used in organizing the computational process for the computer-assisted design of milling fixtures. These procedures can be divided into three groups: Data exchange with the digital model of the fixture design; data exchange with the canonical description of the machined part and other elements of the fixture's surrounding environment; coordinate system transformations. Access is gained to all the data that is processed during the synthesis and documenting of fixture designs by means of the language facilities for accessing the mentioned procedures.

The computational process on the whole can be organized in the following manner. Information about the machined part and the tooled-up manufacturing operation is entered by the "Input" subsystem program set and is then brought to the canonical form of representation and stored on an external medium such as a magnetic disk.

The "Synthesis" subsystem program set begins by reading the canonical model of the machined part from the magnetic disc and accessing the description of the fixture design. Three-dimensional coordinate transformation commands and operations that access data from the canonical model of the input job are used to analyze the properties of the machined part and the characteristics of the tooled-up manufacturing operation to determine the composition, structure and properties of the fixture design as a combination of spatially ordered and metrically determined structural elements.

The construction of the structural element model begins by summoning its basic description from the library on magnetic disc. Additionally specified information about the structural elements (dimensions, shape, position) is recorded in the digital model of the design by means of commands.

The facilities for exchanging data with the digital model of the fixture are used during the machine or interactive synthesis of the structural elements and the design as a whole: When eliminating individual components from it, replacing one structural element by another or making an exhaustive search of the components, and when retrieving and accessing required data from the model.

The application of optimal universal data structures and language to manipulate them in the input job and fixture design models provides convenient access to

frequently used programs, helps to systematize their operation and reduces the time required to create CAD systems.

The use of the OS YeS and DOS YeS operating systems in the development of applied program packages for designing machine-tool attachments has demonstrated their complete validity and effectiveness in solving geometric, graphic and other design problems. The extensive capabilities of these systems to control, run and debug large program sets that contain geometric procedures that construct equipment designs, graphics programs that generate assembly and shop drawings and facilities to automate production preparation and provide manufacturing documentation for its results have been confirmed.

The introduction of equipment CAD systems based on the YeS computer operating systems makes it possible to derive a high yearly economic effect and improve the qualitative characteristics of the designed systems.

12678

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DEVELOPING RECLAMATION PROJECTS IN A HEURISTIC MODE

Riga NAUKA I TEKHNIKA in Russian No 3, Mar 86 p 22

[Article by Yanis Krakop, chief of the department of computer-aided design, Latgiprovodkhoz [Latvian Scientific Research and Design and Development Institute of Water Management Construction]: "Developing Reclamation Projects in a Heuristic Mode"; the first paragraph is a bold-faced introduction]

[Text] Computers are becoming a more important tool of the designer than probably even the pencil. Their contribution improves the quality of projects.

Latgiprovodkhoz [Latvian Scientific Research and Design and Development Institute of Water Management Construction] is an institute developing reclamation projects; it stands out among other organizations in the industry by a special attitude toward computer technology. For almost 15 years, computers have been employed here for design work. In 1975 the institute acquired an ES computer (computer of the Unified System). Elements of automation have been introduced into the development of reclamation projects. New algorithms and programs have been created. In recent years software packages have been developed for the design of linear reclamation structures with the aid of the computer. In 1984 a software package exhibited by Latgiprovodkhoz at VDNKh SSSR [All-Union Exhibition of Economic Achievements of the USSR] in Moscow was awarded a bronze medal. It is used by many affiliate institutions in other cities across the nation--Moscow, Minsk, Kiev, Kaliningrad, Vladivostok and others.

Latgiprovodkhoz is now developing a general technology for computer-aided design. After its introduction the computer equipment complex ARM-S will become the engineer's workplace.

How will this change, for example, the process of design of a rural or forest road?

Laying roads is a part of reclamation projects, because without convenient access routes the croplands and forest tracts which were unsuitable for economic activity before the reclamation project could never be utilized completely.

The procedure involves drawing the route of the road, developing the project of its construction in the vertical plane, performing engineering and technical calculations, preparing cost estimates and all the necessary documentation. At all these steps except for the first one, the work is done with the aid of a computer.

The engineers at the institute decided to improve the entire procedure. They suggested two alternative methods of road design. In the first method, it is assumed that the excavated ground should be utilized entirely in the construction, moving it around as little as possible. These are the major conditions in laying forest roads.

In the second method, the computer not only designs the road but also traces the line of drain ditches along the shoulders, minimizing the construction cost. This alternative is typical for the design of rural roads.

The design procedure is the same in both alternatives. The input data are prepared on magnetic tapes based on landmarks on maps along the route and the drain ditches or the data are entered directly into the computer memory. The design process then begins.

The conversation between the engineer and the computer occurs through the medium of a screen, displaying textual or graphic images. The designer can select the profile of any segment of the road and transfer a drawing onto the graphic display screen. At the same time, tables specifying the amount of excavation work and ground displacement appear on the textual screen. If desired, these tables can be printed out. When the drawing of the future road and the specifications satisfy the engineer, the output information is produced by the computer as the final version.

Cost-estimate documents are then prepared, together with tables specifying the requisite amounts of building materials, machines, mechanisms and labor resources.

ARM-S equipment makes it possible to:

--solve problems as several alternatives and select the optimal one;

--create a quality project with improved technical and economic indicators; and

--raise productivity by reducing the project development time due to the creation of a virtually continuous production cycle.

Substantial savings are also obtained in construction. Estimates have shown that the design of roads with multiple-alternative mode and choice of the optimum solution can lead to a savings in construction costs by 10-15 percent. This means a saving of funds for the construction of an additional 50-60 km of road on reclaimed land.

ARM-S has already carved out a place for itself in the system of computer-aided design at Latgiprovodkhoz: All the rural and forest roads designed in

1984–1985, with a total length of more than 1000 km, have been "run by" it. The advantages of the system are obvious. In areas where versatile computer equipment is still used which does not offer an option of computerized search such as in the design of open ditches and drain collectors, there are also plans to introduce the new technology.

9922
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YeSKD CLASSIFIER- A BASIS FOR ORGANIZING SEARCHES FOR DESIGN DOCUMENTS

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 1, Jan 85 pp 75-77

[Article by B. Kiryushchenko, candidate of economic sciences, Vinnitsa, and A. Onishchenko, senior scientific staff member, Scientific Research and Production Design Institute for Machine Building, Kramatorsk]

[Text] The classifier for items and design documents (YeSKD classifier) is a document which establishes an ordering of a system of items, constituent parts and components according to determined classification characteristic criteria. The YeSKD classifier contains classification groups for all items which have been or are to be developed (items, assembly units, sets, complexes, aggregates and lines) of primary and secondary types for which design documentation according to YeSKD has been developed and also general technical documentation (standards, regulations, requirements and methods) for items included in the classifier. It contains 100 classes, 50 of which are reserved and can be used for the insertion of new types of items during the 24 year period of effectiveness of the classifier.

The classes of the YeSKD classifier contain: a network of subclasses and groups; and classification tables of subgroups and types. The subclass "0" (null) is used for the classification of general documents.

All items entering into the YeSKD are divided into specialized and nonspecialized. The specialized items comprise assembly units, sets and complexes. The nonspecialized items comprise components (constituent parts of items). Thus the YeSKD classifier is a specific list of various homogeneous (single-type) items which are assigned codes (classification characteristics).

There is a five-level structure for designating items and design documents: class, subclass, group, subgroup and type. Taking into account all stages of the division, this structure forms a six-digit classification characteristic for the item (code). For example, the code 472412 indicates once-through vertical drum wire drawing benches and the digits have the following meanings: 47- class (metallurgical equipment); 2- subclass (rolling equipment for the fabrication of solid and hollow profiles); 4- group (wire drawing bench); 1- subgroup (for wire drawing, once-through); 2- type (with vertical drum, throughput of bundle downwards).

Determination of the code for components is carried out according to the classification networks and tables of classes 71, 72, 73, 74, 75 and 76. For example, a flange is a rotary item with external cylindrical stepped surface without a thread, with a central combining opening and nonaxial opening. Determination of the classification characteristic of the flange is given in Table 1.

Table 1. Classification Characteristic for Flange

(1) Признак детали	(2) Ступень классификации	(3) Код
(4) Деталь — тело вращения	(9) Класс	71
(5) Параметрический признак детали ($l/a<0,5$)	(10) Подкласс	711
(6) Наружная поверхность детали (цилиндрическая ступенчатая без наружной резьбы)	(11) Группа	7113
(7) Наличие в детали центрального сквозного отверстия	(12) Подгруппа	71137
(8) Наличие в детали кольцевых пазов на торцах, шлицев на наружной поверхности дополнительных отверстий	(13) Вид	711372

Key:
1. Criterion of component
2. Level of classification
3. Code
4. Component- solid of revolution
5. Parametric criterion of component ($1/a < 0.5$)
6. External surface of component (cylindrical step without external thread)
7. Presence in component of central end-to-end opening
8. Presence in component of ring grooves on ends, splines on external surfaces of additional openings
9. Class
10. Subclass
11. Group
12. Subgroup
13. Type

The allocation of the code for assembly units is carried out according to the classification networks of classes of different types of technology and also according to class 30. Class 30 contains general machine building assembly units. For example, the cylindrical single-step RTsO-700 reduction gear is a general machine building assembly unit (an example of the classification characteristic designation for the reduction gear is given in Table 2).

From the above it follows that the YeSKD classifier was developed for specific and particular objectives, tasks and spheres of use:
-Designation of items and their design documents according to a unified system for all branches of industry;
-Establishment in the country of a unified All-Union standardized classification system for the designation of design documents which supplies, for all branches of industry, a unified procedure for the structure, execution, record-

ing, storage and circulation of these documents;
-Establishment of the possibility of using various enterprises and organizations in the design and production of design documentation developed by other organizations without reexecution of the documents;
-Utilization of classification groupings for detecting the volume of once-through (single-type) items and volumes for specialized production (articles, components or production items).

Table 2. Classification Characteristic for RTsO-700 Reduction Gear

(1) Признак изделия	(2) Ступень классификации	(3) Код
(4) Сборочная единица общемашиностроительная	(9) Класс	30
(5) Устройство, передающее движение	(10) Подкласс	303
(6) Редуктора	(11) Группа	3031
(7) Цилиндрические одноступенчатые	(12) Подгруппа	30311
(8) С межцентровым расстоянием (А=700 мм)	(13) Вид	303116

1. Criterion of item
2. Level of classification
3. Code
4. General machine building assembly unit
5. Equipment for motion transmission
6. Reduction gear
7. Cylindrical single-step
8. With inter-center distance (A= 700 mm)
9. Class
10. Subclass
11. Group
12. Subgroup
13. Type

The YeSKD classifier is the only system which makes it possible to improve the effectiveness of search and adoption procedures for design solutions. The system for searching design documentation involves carrying out the following tasks:
-Entry in the systematization table and record card of the designations of information on the newly developed design documentation;
-Correction of the systematization and record files of designations according to "notices of changes";
-Search of analogs (prototypes) of designations of items and design documents entered on the inquiry card for the document search pattern (DSP card);
-Systematization of items according to the characteristic required by the developer (designer, technician).

The execution of the indicated tasks is carried out by computer data processing. However, noncomputer (manual) searching of design documents is the only solution for many enterprises; and even for those enterprises where computer technology is used, manual searching will predominate for a certain period.

Reasearch showed that the system of noncomputer searching of design documents in enterprises and organizations is effective for an operational stock of up to 100 thousand drawings with an inquiry frequency of 230-250 times per month.

For a volume of design documentation of more than 100 thousand drawings and an inquiry frequency of 250 times per month or more it is not advisable to use noncomputer search.

[Gap in Russian text.]

The introduction of searching for required design documents according to the described classifier in enterprises and organizations in order to facilitate the adoption of technical solutions allows designers in their productive activity to operationally find and use existing documentation. This makes it possible to concentrate the production of homogeneous (single-type) items and isolate their fabrication in independent specialized units which, in the end, reduces the time necessary for their fabrication and labor-consumption.

12497
CSO: 1863/210

RESEARCH ON VIRUS IDENTIFICATION, GAS CLEANING DISCUSSED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 10, 20 May-2 Jun 86 p 6

[Article: "Life in a Scientific Center"]

[Text] Of the many investigations conducted at LMRB we selected three, that is, virus identification by means of laser correlation spectroscopy, flow cytofluorometry, and new petroleum and gas cleaning methods.

The possibility of determining, by means of an appropriate mathematical processing of diffuse light spectrums on a computer, the sizes and number of microparticles contained in a liquid appeared relatively recently. The laboratory decided to apply it for the study of the blood composition. It turned out that the blood serum of healthy people did not have particles of a size ranging from 100 to 1,000 angstroms. At the same time, most infectious viruses have precisely these sizes. Thus, alluring prospects have opened up: Having established the size of a specific virus, make a quick diagnosis of various diseases. Experiments were conducted on causative agents of hepatitis ([Associates] learned to detect them reliably in 3 to 5 minutes.) and then, just as successfully, on other biological entities.

Radioprotectors--substances protecting the body against radiation--often include sulfur-containing groups, which neutralize active chemical radicals appearing during irradiation. However, similar compounds--also sulfur-containing--worsen the quality... of organic fuels. LMRB associates decided to get rid of sulfur-containing admixtures by means... of other sulfur-containing admixtures. Aminothiols, 1 kg of which proved to be sufficient for the cleaning of 10,000 tons of petroleum products, were suitable for this. An original method of cleaning natural gas by means of iodine-containing complexes was also proposed.

11439
CSO: 1863/332

NEW EYE CLINIC FOR CHUVASH ASSR

Moscow PRAVDA in Russian 8 Sep 86 p 2

[Article by Yu. Knyazev: "A Quarter Century Ago"]

[Text] The construction of an affiliate of the Eye Microsurgery Complex began in the capital of Chuvashiya.

In the future complex affiliate in Cheboksary there are provisions for excellent conditions for patients, and the introduction of progressive treatment methods. There will be an automated line for rapid and high quality treatment of eye diseases. The use of this "conveyor," serving as a genuine symbol of the field, will sharply increase the number of people to whom normal vision will return. The new medical project will go into operation next year. The collective at the Cheboksary complex will also serve the populations in a number of oblasts and autonomous republics adjacent to Chuvashiya.

Fittingly, it was in Cheboksary a little more than 25 years ago that S. Fedorov, then a young doctor, and now the manager of a new scientific and technical field in medicine and a correspondent member of the USSR Academy of Medical Sciences, first performed a transplant of an artificial lens for a human eye. The patient was Ye. Petrova, a young Chuvash school pupil. A little later the same operation was performed for the young lady's other eye. It must be admitted that there were sceptics who did not believe in the success of this innovation and made various suggestions. Petrova has not only successfully completed secondary school, but also a VUZ and has become a rural school teacher.

11574
CSO: 1863/2

CONFLICT IN SCHOOL COMPUTERIZATION DESCRIBED

Moscow SOVETSKAYA ROSSIYA in Russian 30 May 86 p 2

[Article by I. Vedeneyeva: "The Computer Failed the Lesson"]

[Text] Dear Editors! The Party Congress presented Soviet schools the task of improving the ideological-political, moral and labor education of the younger generation. Therefore, the Physics-Mathematics School No. 2, in Oktyabrskiy Rayon, Moscow jointly with its patron organization (The Institute for General Physics, USSR Academy of Sciences), set up a computer class. However, in compiling a document on putting the classroom into operation difficulties arose. These involve differing interpretations of safety requirements by the patron organization and official representitives of the sanitation-epidemological station and the fire inspectors. It seems to us that the solution to this situation is to publish standardized requirements for similar classrooms. We ask you to assist in solving these questions so that computer terminal classes can open on time.

School Director
R. I. Pryamostanova

Party Buro Secretary
A. F. Suzdaltsev

Trade Union Committee
Chairman
N. G. Kasyanenko

This letter arrived at the editorial board when material on the fate of the computer class at Physics-Mathematics School No. 2 had already been prepared for press.

One could write a good story about a this young person. One could explain, for example, how even back in the school benches Andrey Filippov was totally absorbed in physics and electronics. After finishing Physics-Mathematics School and then MFTI [Moscow Physical-Technical Institute], he went to work at IOFAN [Institute for General Physics, USSR Academy of Sciences]. There he became a computer "fanatic," a specialist in personal computers. His candidate dissertation was already prepared when the young scientist called upon the Institute Party Committee and asked for help. The Institute told him that for many years it had been assisting the Physics-Mathematics School No. 2. The party raykom had asked that a computer class for informatics be set up at this

school. As he was an ace on these questions, there was no way to get along without him.

Soon almost every evening there were two people at school -- Andrey Filippov and Vasiliy Bessonov, another associate at the Institute. The Institute allocated more than 50,000 rubles and acquired 13 Agat PC's. Work began.

Anybody who thinks a little bit about what a computer room involves can easily understand what it is to set one up in an absolutely unsuitable space. In the evenings, together with senior class students they spackled the walls, sanded, washed and cleaned. Of course, they talked and talked, about machines, about the future, about "computer society," problems and huge potentials. In general, it was happy and interesting.

Later, the patron got the idea: Why not set up, based at this school, not just a computer class, but an educational-methodological center? Here the pupils themselves would teach young people how to use PC's, write their own programs on the most diverse subjects -- physics, history, chemistry, astronomy, foreign languages, etc. and then use them to teach other classes and schools?

By the end of February the room was almost ready, all the computers were at the work stations and a sizable share had been debugged, with the help of the young people themselves. A users' council, consisting of the most active senior class students, was created and the appropriate rules and instructions worked out. The day arrived. It was announced and they, who had long waited for the word, were to begin work at the Computer Science Room. Work hours were from 3 to 6 pm. Admission was open to all interested in the hardware!

On Monday R. I. Pryamostanova, the school director locked the door and gave the keys to the zavkhoz [head of operations].

Unfortunately, this ends the positive story on Andrey Filippov. A quite different story now begins.

R. I. Pryamostanova was in the hospital the entire time work was under way on the computer class and Filippov and the young people were spackling, washing, painting, fixing up and dreaming deep into the night. Of course, she knew about this work, but had not seen the room itself. When she did visit it she gasped. Students were sitting at the machines working, alone, without adults! Bessonov, the engineer on duty that day, arrived with some sort of tool and then left five minutes later.

The director quickly announced that the class had not been officially turned over to her and locked the doors.

Week after week went by and the class remained closed. The computers, ready for work, stood idle. The director gave reason after reason to the Institute's inquiries about what was wrong. There was no special document about opening the class. Scientists then prepared it. A special patronage assistance contract was written which assured that the Institute would assume a multitude of obligations and that the director would have no problems with the room and machines. However, the director signed neither.

The scientists could not understand why the school refused the voluntary help. This became an unsolved puzzle to the Institute for General Physics.

Of course, one could simply give the machines to the school and forget about them, but that would be wasting equipment. Agat machines are good, but capricious, at times breaking down. One must be able to fix them. At school, of course, there are no specialists on the Agats. The scientists were concerned about the director's idea to transfer the computer class to the vocational training instructor.

Finally, Raisa Ilinichna said quite definitely: Remove the contract's fourth paragraph and we will sign the document and contract.

"Andrey Nikolayevich is given responsibility for the room of computer equipment from IOFAN..."

This is from the fourth paragraph on patronage assistance.

Why did Andrey Filippov, who had done so much for the school, not please the director? Why was she not pleased with a person whom the children loved, who had so many ideas and suggestions and who so desired to work for the common good? We will attempt to understand the director.

Raysa Ilinichna says: "I am not against computers, but Filippov uses forbidden methods and works through back channels, that is, he deals with the children, bypassing the pedagogic collective. Take a look and see how the Ninth B class has changed in these months with Filippov. This is a difficult class and has lost all discipline. The children criticize everything, nothing pleases them. They demand that the computer class be opened for them. The culmination of his influence was the report-election meeting of the school Komsomol when the committee secretary, a girl in this same ninth grade, made a report without consulting me or the educational manager. Rather than talking about testing, which is going quite well in our school, or evaluating the sectors' work, she looked for shortcomings and criticized things. Do you think that this quiet girl thought up these on her own? This is clearly Filippov's influence!"

This is the director's opinion. I also talked with the young people. They too recalled the meeting which, in their opinion, was sharp and vivid. Instead of an ordinary report there was a vivid speech by the secretary who talked about everything that was wrong, about the Museum of Military Glory, one of the rayon's best, which is always closed, about the computer class -- that it will not suffer the Museum's fate. She talked about the sports hall, in which anybody can play after lessons, anybody but school pupils. About formalism in Komsomol work. When the director attempted to stop the secretary's report, she noted that this was a report-election Komsomol meeting.

It must be said that our subsequent dialogues with the school director were similar to the child's game "broken telephone." Raisa Ilinichna sadly stated that some scientists were not so selfless, and refused to work until they were given bonuses. However, it is clear that as soon as the school presented Filippov and Bessonov the room they started to work, not waiting for any

bonuses, and that all this, to put it softly, is not true. Raisa Ilinichna immediately and impassivly says that she was not correctly understood. In describing the Komsomol meeting, she mentioned leaflets which were apparently handed out by Filippov's followers. However, it turns out that there were no such leaflets. How is that, Raisa Ilinichna? It is clear out that the director has nothing against the meeting, and it is good that the secretary spoke truthfully and openly. The school always supports such young people. As a matter of fact, it was she, the director, who turned to the editors for help and wrote a letter requesting that "the educational computer terminal class open on time." Is it possible that the correspondent is "against children's safety."

There is no answer to this.

R. N. Kartashova, the head of the Information and Computer Science Department, Moscow Main Administration for Public Education:

"The school computerization situation is difficult. There are not enough machines. Where there are, many do not work and the schools themselves cannot fix them. Patrons often see help as only buying computers. In this case there could be an ideal alternative, the patrons themselves straining to help. This has not occurred. What can we do?"

Recently, life at school has been busy. Commission after commission has arrived. Who wrote and why, who did what to whom and with what was to be cleared up. There have been parents' meetings. Excited children and the tired girl -- now the former secretary of the Komsomol organization -- wandered around. The commissions came and left, and I heard a thousand different opinions. It was shown that the patrons didn't do everything: there were no tables, no housing, no lights, scientists or computers and, incidentally, the children go to the computer center once a week, it is not bad for them there, while in Japan computers have been taken from kindergartens because they were found to be harmful for children there. There was the impression that the patrons simply forced their way into the school, seized a class, filled it full of expensive equipment not needed by anybody, and Filippov, clearly out of hooliganish intent, rather than write a candidates' dissertation, loafed around the school during his entire leave, washing, cleaning, thinking up all sorts of "Users Councils" and disturbing the school's normal operation.

It seems to me that the matter is not simply one of the personal relations between the school director and Institute scientists. I think that the conflict is much deeper and serious. Customary ways of life and habitual relationships between adults and children and teachers and students are being disturbed.

From the beginning the scientists put the children on terms equal to grownups. They felt they could be trusted. This was the only way to maximize their creative independence and public activities. According to the contract, which the director steadfastly refused to sign, members of the users council were to have attended adult commission meetings, for example when the computer room was transferred.

We write: there are not enough enthusiasts and creative people... Then they appeared. It turns out that they disturb things, bring in chaos and harm teaching.

How will all this end? Possibly, the patrons will do what most do -- supply the machines, set them up and disappear -- returning to scientific humdrum and dissertations.

Will this suit us all?

11574
CSO: 1863/2

OFFICIALS HINDER GOODS EXCHANGE CIRCLE COMPUTER GAMES

Tallinn SOVETSKAYA ESTONIYA in Russian 10 Jun 86 p 2

[Article by L. Shurukht, Informatics teacher, Talinn 19th Secondary School: "On Computer Games and... Bureaucratic Games"]

[Text] A noteworthy idea was thought up at ESSR Minbyt [Ministry of Consumer Services -- a computer class on wheels (SOVETSKAYA ESTONIYA No. 83 4 Apr 86). Joking aside, it is well known that in mastering a modern personal computer, any person, whether a pupil or grownup, begins with electronic games. They are interesting activities and can be played for hours without tiring. Sooner or later, after mastering a series of computer games the question legitimately arises -- what next? Now, when the Fundamentals of Informatics and Computer Science have been introduced at hundreds of schools and thousands of pupils know the ABC's of the second literacy -- what next? Perhaps pupils today and tomorrow can pose, test and solve real applied tasks using computers?

Life itself answered these questions. This can be done, not without difficulties, but with great desire and corresponding success. In SOVETSKAYA ESTONIYA back in 1983 (No. 281, 8 December) adult booklovers were invited to participate in experimental cybernetic games in an intercity book exchange circle. These by no means childish games are played by pupils in the Yuta Club for Applied Cybernetics Activists at the Kadriorgskiy ZhEU [Residential operational section] in Tallin. Thought up for convenience in communicating with subscribers -- the artificial personage -- the robotess Yuta answers thousands of letters from booklovers in dozens of cities and villages in our country, including subscribers from Vyru, Tartu, Narva, Tallinn and Pyarnu who have responded to invitations to participate in the experiment (in addition to SOVETSKAYA ESTONIYA this was described VECHERNIY TALLIN, MOLODEZH ESTONIY and the weekly KNIZHNOYE OBOZRENIYE).

The man-machine dialogue (the machine is Yuta) includes 102 multicomponent book exchange circles totalling 702 books. Instead of books one can list appartments, collections of things, stamps, spare parts, any object in high demand, the redistribution of which, with the voluntary agreement of their owners, is needed by society. All these, and many other similar tasks, are solved with the help of cybernetic games -- they are games because results are unknown ahead of time and depend upon the participants' strategy and tactics

in selecting books, apartments, train tickets, etc. Computers search for the outcome most beneficial to all participants. These are collective games without loosers. In the worst case the participants keep their items, not receiving anything in exchange.

Three years' experience in the Yuta Club's work is evidence of the great potentials for enlisting pupils into useful work, within the limits of their capabilities, in the use of computers in the interests of school, family and society. Their participation in posing, elaborating, and testing, and in the experimental and regular implementation of such tasks actively stimulates studying informatics and mastering computer literacy. On the other hand, the simple programming of purely academic tasks quickly reduces interest in the subject and educational efficiency declines.

There are already preliminary contracts on the creation, in Tallinn, of an interschool association for applied cybernetics. Together with the Yuta Club this will include the 15th, 19th, and 56th Secondary Schools, which have domestic DVK-2M interactive computer systems, the 26th Secondary School, which signed a contract for machine time use with the ESSR Ministry of Construction's Central Construction and Outfitting Administration; the USSR Ministry of the Merchant Fleet's Maritime Academy at Tallinn and the Oktyabrskiy Rayon Department of Education's Academic-production Combinat, the owner of a computer class equipped with 15 Yamaha personal computers.

The association has set itself the goal of posing, elaborating, testing, doing the needed research, and the experimental and regular operation of a large set of applied tasks, including the above mentioned public information-advisory services in various spheres of computer use. The ESSR Ministry of Consumer Services, which took the laudable initiative discussed early in this article, could be the most natural client and partner for the association. Led by experienced programmers, workers at the numerous computer centers in Tallinn, educational-production brigades of pupils could sign contracts to perform specific lists of services to the public.

Keep something else in mind. The recently approved Comprehensive Program for the Production of Mass Consumption Goods and Services During 1986-2000 makes provisions to now enlist enterprises and organizations in all ministries and departments, independently of their activities, into performing paid services. It is extremely important that the additional profits (over the 1985 base year) remain completely at the disposal of enterprises and organizations rendering such "nonprofile" services. Up to 30 percent of this sum can be used as incentives for service workers and the remaining used to finance the material technical base and other measures to increase the volume and expand the range of services. It will take hundreds and thousands of rubles annually to solve tasks such as assistance to the public in multi-element circles for exchanging apartments, books and stamps and in other spheres.

School informatics, as an association for applied cybernetics, can in a few years, completely equip itself with computer and copy equipment so needed by schools for teaching academic subjects.

Everything would be fine with cybernetic games if some comrades in positions of responsibility in the republic would not oppose the spirit and letter of 27th Party Congress decisions by playing bureaucratic games and place serious obstacles on the road to school reforms which are actively enlisting young people into socially useful labor. Examples of this formalistic, bureaucratic additude to pupils' needs are shown by V M. Chizh, deputy director of ESSR TsSU's Collective Use Computer Center and V. G. Nikolayev, chief of the department for this center's development. I will explain.

The Kadriorgskoye ZhEU, which provided space for the Yuta Club, rents machine time for the students through a very modest allocation for circle work with adolescents at their residences. For the past year and a half pupils have been working at the TsSU Computer Center. While working in previous years at another center using similar ES model computers, the ZhEU paid 2,500-3,000 rubles rent. At the TsSU Computer Center, with the same use intensity, it is required to pay that much monthly! What is the matter? Why, with country wide standard for machine time prices, has machine time rental cost increased by an order of magnitude? The explanation is quite simple. Outside users at the TsSU pay the hourly rate for machine time even during that time when a person at a terminal is only engaged in data preparation and input. While the person is really only using minutes or even seconds of machine time, payment is for an entire hour, from 90 to 135 rubles. True, last year they started dividing these hours by the number of people simultaneously using the machine, reducing the costs. All the same, this is nothing but eyewash, thanks to which VTsKP's taut financial plan is easily fulfilled and overfulfilled. All VTsKP users know this, and criticize it in the hallways, but do not want to spoil their relationship with the management. Anyway, the money is not out of their pockets, so its no bother. Refering to USSR TsSU instructions, the VTsKP management claims some sort of "legal" right to take this 12 fold price from users. However, other computer centers (for example ESSR Gosstroy), based upon the same country wide price list, have been able to introduce programs which take into account the actual use of machine time with a high degree of accuracy. Above all, they exclude handwritten entries into logs, that is, make impossible exaggeration and wide ranging arbitary action authorized by "instructions."

When the Kadriorgskiy ZhEU asked the VTsKP TsSU to examine the possibility of regulating prices, keeping in mind that these were children's exercises, comrades Chizh and Nikolayev answered this by.. banishing pupils from their "machine paradise." This was by an openly formal pretext, saying the Kadriorgskiy ZhEU was not on the list of enterprises and organizations the ESSR Council of Ministers had given the VTsKP. Thus, by the stroke of an official's pen, pupils were deprived of practical exercises at terminal classes, which are especially valuable as they are not available at any other center in the city, except the center at ESSR Gosplan. They were also deprived of guidance by VTsKP workers who, with the administration's authorization, had agreed that during their free time they would assist the young people, not leaving them alone with expensive hardware. Finally, there was a whole series of problems the Yuta Club could solve only because at the VTsKP they had access to a powerful computer, of which there are only a few in Tallinn. Also, as a result they did not fulfill the contract under which the club undertook to transfer the set of programs developed to the State Fund for Algorithms and

Programs so they could be subsequently applied throughout the entire Soviet Union.

The "gains" which VTsKP TsSU got for itself are very doubtful, but there can be no doubts concerning the social harm from this attitude towards educating pupils.

11574
CSO: 1863/2

MOBILE COMPUTER CLASS IN TOMSK OBLAST DESCRIBED

Moscow IZVESTIYA in Russian 3 Sep 86 p 3

[Article by L. Levitskiy: "Computer Class in a Bus"]

[Text] First, some history. The longest road in the Oblast is a 1,000 km winter road running north from Tomsk. This road, supplying the area along the Ob River, is crowded with large trucks. Among them a small bright red bus driving down the frozen road looked like a toy moving through the fir trees in January. The microbus crew was really hurrying to school for serious games -- computer games. This was a unique computer commando force. It was led by V. Gnyrya, a graduate student at the Institute for Automated Management Systems and Electronics. He and his assistants, the students K. Chelnintsev, M. Loos and S. Khudashov worked on the principle it was easier to deliver computers to rural areas than to deliver students to Tomsk.

The first stop was the village of Volodino on a steep bank of the Ob. Time was not wasted. While V. Gnyrya and K. Chelnintsev installed the hardware in the classroom, their assistants reviewed computer ABC's with the students. This covered six lessons. Many of them and the teachers stayed afterwards -- not leaving the wonderful technology.

During the winter vacations the detachment visited schools in two rayons -- they could not visit more. After returning, requests for visits arrived from rural schools.

Schools are quite conservative. Innovations in the educational process are usually introduced gradually and experimentally and subjected to prolonged review. There was not time to do this for the course "Fundamentals of Informatics and Computer Technology," and it was delayed. Understandably, in Tomsk, with its abundance of institutes and plants having excellent computer centers and automated systems of various types, schools and pupils have, to varying extents, become acquainted with the ABC's of cybernetics. This is most frequently through circles led by scientists, engineers and programmers. Computer hardware has appeared in the schools.

Somehow, I was very surprised by the second grade classroom in School 9. On the board were words to be memorized: "cow," "milk," and next to them "computer" and "calculator." Are they comprehensible to children?

"Completely," T. Rostova, the teacher, assured me. Children "converse" and play games with computers. Even young ones write and solve problems on them. They are slowly getting acquainted with modern technology.

Not everything is so simple. Later I learned: Tatyana Vasilevna is looking for methods to acquaint the younger classes with computers and decided to have a circle for them. There they will learn to use calculators before they can write the word.

Six years ago School 9, together with the pedagogical institute decided to check up on how the new forms of teaching were being mastered, or, more accurately, how computers were being used in the teaching process. Patrons -- the Institute of Atmospheric Optics -- donated the equipment needed, equipped a special class and gave the young people several terminals from their computer center. The speciality laboratory assistant-programmer has appeared in job training. There are already several graduates at institute computers. Tenth graders were the prize winners in the competition among young specialists. This suprised nobody.

Computers have been turned into learned assistants to teachers. Educational programs in Russian, physics and other subjects have been introduced. Computer consultation is available to all students. They receive exhaustive explanations. Personal computers also act as examination givers. Questions are given and checked. After this errors are explained and more correct and original solutions offered. Games are also creative. Therefore, communication with computers is not exhausting, but interesting, a motor for learning.

School 9, headed by G. Psakhye, is located in the Tomsk Academgorodok. It is surrounded by scientific institutes. This says much, but not all. Its experience is also convincing. It has a good technical base and teachers with initiative and is no stranger to informatics. It is accessible to students of all ages. The earlier the acquaintance the more natural.

However, not all schools are near institutes. They don't have to be. At the beginning of the year there was a programming olympiad in Tomsk. More than 150 students from various schools and professional-technical academies competed in their knowledge of machine languages, abilities at logical thought and compiling algorithms. The results showed that informatics was not studied in vain. True, most of the best work was writen in BASIC -- members of circles at institutes and enterprises distinguished themselves. However, even ordinary students, who had only used educational aids, did not do badly. The results were unexpected. The group from School 89 won, beating School 9 by 2 points. That school is ordinary, and not spoiled by attention. A 9th grader in one of the groups prefaced her work by the epigraph: "The world, full of puzzles and scientific problems, is open to the friends of computers."

How did the Tomsk students shorten and straighten this road? After all the olympiad was only six months after the introduction of an informatics course.

Above all, the teachers were not not alone in facing it. A methodological council for school computerization was set up at the party obkom. It was

headed by Professor V. Yampolskiy, director of the Kibernetik Educational-Scientific Complex at the Polytechnic Institute. According to the council plan all future information science teachers will undergo 150 hours of training at Tomsk computer centers. Scientists have also worked out designs for computer equipped offices, fitted out 10 demonstration computer classes and prepared software. As one cannot dream of computers for every school, upon the council's recommendation, programmable calculators were obtained for exercises. These are also in short supply, and only the simplest ones are being centrally supplied. Base enterprises came to the rescue, purchasing 1,000 programable calculators through their channels. Methodological aids for their use were compiled by T. Poddubnaya from the University and V. Alimov from the Polytechnic Institute. So, city pupils' had no particular problems in starting to get acquainted with computers.

However, these problems remained at rural schools. Teaching by texts, tables and charts is not very enticing. One often hears teachers complain: learning about computers through books is like learning to play a piano by using a picture of the keyboard. By a decison of the Methodological Council, Tomsk institutes set up computer centers for pupils in eight rural rayons. They are held during winter vacations.

So, during vacation, young people often went to classes. At the suggestion of V. Yampolskiy, they were structured so that students become acquainted with the development and prospects for computer technology, summarize school courses and let each pupil work two lessons on a personal computer, with unobtrusive help from experienced programmers. Many young people first discovered informatics at meetings with scientists in computer centers. It was interesting learning about machines and themselves.

The Tomsk experiment was approved by the republic Ministry of Education. It was a busy experiment, organizing the delivery of a multitude of 9th graders to the city and feeding them there. The institutes voluntarily assumed a large load. The number of rural pupils who need to practice at the computer center has now doubled. Concerns and worries are not feared, but put one to thinking. This is how a contract was signed covering cooperation between the Oblast Educational Department and the Institute for ASU and Radioelectronics to create a mobile computer class.

The Institute set up a student scientific-production detachment (the students call it scientific-educational), allocated computers and peripherals, designed containers and wrote up a set of exercises. The Oblono paid for renting a bus, detachment members' travel expenses and set the schedule for the group. The success and need for the winter computer group also predetermined the summer alternative. However, in summer the road is the river. The Oblast Staff for Student Detachments and the Oblono attempted to rent a small ship in the Port of Tomsk. They were offered Rakety or Meteory. Alas, the cost was beyond the educational budget. The detachment took shelter on a ship with participants in the Northern Lights Art Festival. The singers' schedule determined the computer's schedule. Nevertheless, the students visited almost all schools in three rayons. At these schools they also taught 9th graders on work study. In the village of Kolominskiye Grivy young people arrived from farms. All of them were milkers, and this gave direction to the discussions. In the final account

they all agreed that modern computers would be very useful to farms, or more accurately to specialists managing them. V. Luchnin, the school director, was disappointed.

"Eh, we need our computer class. Our patron, the Sovkhoz imeni 60 Years of October, will spend the money to equip it, but where can it be bought?"

Many rural school directors posed the same question.

Z. Neznanova, Oblono deputy chief, explains, "We are oriented towards support schools with well-equipped computer classes. In Tomsk we succeed in expanding their network and got equipment. The first imported and domestic educational computer complexes have appeared." One such complex was given to Strezhevaya. The oil workers there have a large computer center. They will be able to combine training with production. Young people will be brought here from two other northern rayons. We are also relying on the town of Kolpashevo, but we still need computer commando forces very much, both in winter and summer. There are no special mobile classes in the country. Together with institutes we are prepared to set them up independently.

The idea of a mobile class is very tempting. The Tomsk institutes have enough computers and would share them for such an excellent undertaking. There are enough to equip computer commando forces. This is not being done for charity, or under compulsion. The collaboration with teachers is beginning the convergence of school and VUZ computer courses.

The feasibility of computers in buses and computer commando forces has been proven. The Tomsk initiative was approved. What next? One detachment will not cover the entire oblast. In neighboring Siberian regions the majority of villages are remote from cities and enterprise computer centers. Industry is still not hurrying to supply small schools with personal computers. Mobile classes with 3-5 computers could ease the equipment shortage and the lack of qualified teachers.

11574
CSO: 1863/2

TEACHERS' ROLE IN SCHOOL COMPUTER USE

Moscow SOTSIALISTICHESKIY TRUD in Russian 16 Apr 86 p 3

[Article by A. Matyushkin, candidate of pedagogical sciences, docent, Leningrad Institute for Improving Qualifications in Management Methods and Technology: "Computerization with Obstacles -- Problematic Remarks"]

[Text] It was with interest that I read in SOTSIALISTICHESKAYA INDUSTRIYA the discussion with Academician Aleksandrov, "Pupils and Computers". Personally, it seems to me that the main reason for failures in the introduction of a new school course is that the individuals and institutions responsible for this work are based on a small circle of specialists. Some are theoretical scientists, while others have no serious training or experience in this area.

Please excuse me for this harsh judgement, but this question is extremely important. This is stated in the materials from the 27th CPSU Congress and many other party and state documents.

What is the situation regarding practical implementation? A central role in universal education about computers is to be played by "The Foundations of Information Science and Computer Technology". The use of this (for 9th grade pupils) began at the beginning of last year. I live and work in Leningrad, and know that much is being done by local party organs, the main administration and rayon departments of public education, a number of VUZ's in the city and teachers giving these courses.

Unfortunately, however, not everything can be solved locally. Programs, not capable of solving the tasks in the secondary and professional school reform, arrive only after long delays. It is for good reason that the appendix to the tonyusenkiy [trans. unknown] training aid had to have several fold more instructions for its use. An here is the biggest cause for concern. Any public criticism of these materials was solidly blocked, and the ideas of specialists holding to other perspectives are viewed as deliberate heresies and do not reach the scientific-pedagodic community.

Nobody disputes that teachers aids are now simply necessary. The question is what sort of aids. Teachers must be helped in getting acquainted with what is beyond the limits of school courses and be explained about prospective developments in computer technology and directions in methods for using them

and be given recommendations on the preparations for various methods of using computers in the educational process.

I am in complete agreement with Academician Aleksandrov: It is not very easy to be a teacher today. They have short term summer courses on their shoulders, these aids in their hands, and, arriving by various channels, information, which at times is capable of disorienting them. A chemistry specialist, for example, writes an article which "will compare a composition (literary, not chemical) of a pupil at any level and grade it". It would be interesting, if such a system could be built, at what level it would compare the works of Puskhkin, Gorky, Sholokhov, for example.

A department head at a respected VUZ expressed the thought that pupils who have not even completed the new course will be sufficiently trained to create "industrial programming products".

Another young programmers circle leader did not hesitate to express the conviction that the aid they developed should be the model for setting up a general course on information science and computer technology.

On the pages of a youth journal we read: "In the not too distant future we can fully see a situation where a person seated at a computer will have only one "skill" -- pressing the "Help" button. The computer will teach everything else.

I think this is enough such statements, which so simplify the problem. All of us, and especially those who are working at school, should understand that computer literacy can by no means be reduced to more or less detailed ideas about computer structure and functional principles, to specific skills in algorithm writing and programming and work habits with terminals. The main component in computer literacy is an understanding of the the technology's potentials in specific application areas. This is the ability to correctly approach and select paths and methods for such use and to implement it (as a rule, with help from various specialists). This means it is time for high quality programs and texts. A well organized system for teacher training is also needed. This does not only apply to those who will conduct exercises in the new course. If we remain only within its framework, we cannot solve all the tasks facing us. Computer technology should be actively, diversely (and, most importantly, intelligently) used in the educational process for other disciplines.

This requires a deeply thought out approach, careful preparation and the thorough restructuring of teaching. A review of instruction content is also undoubtedly necessary, otherwise the computer's richest possibilities will, in the best of cases, be wasted on trifles. Understandably, there should be no place for any light weight solutions, or for using computers in the educational process simply for the sake of their use. Such an approach can only do harm, and undermine young peoples' faith in the potentials of computer technology.

Work outside the classroom must be activated and restructured. The overwhelming majority of competitions and olymiads now conducted are oriented mainly towards the development of algorithms and programs for solving miniature puzzles. This is not bad in itself. However, in restricting ourselves only to this, we will unwittingly strengthen young people's idea that all computer problems can be reduced to such programming.

Organizing students' collective work on comprehensive solutions to various practical tasks would not only help in the formation of their scientific-technical thinking, but would substantially expand the circle of participants. Young people not having any special capabilities in programming could show their skills in other directions, in posing the problem, in creating the needed information, designing the nonmachine part of the system and in actively participating in its operation.

The computer technology supply question is now very acute. Its correct solution requires determining where how much of what kind of equipment should be used. It seems that initially in schools it would be best to build training stands based upon programmable microcalculators, keeping in mind that they will be used not only for lessons in information science, but also in mathematics, physics and other disciplines.

Sufficiently precise ideas about what technology is needed in the next few years and how it will be used in secondary schools are also necessary for planning the creation of appropriate educational software.

11574
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A TRAINING COMPUTER

Riga NAUKA I TEKHNIKA in Russian No 3, Mar 86 p 5

[Article by I. Lenskiy, engineer, and E. Livshits, engineer: "A Training Computer"]

[Text] Acceleration of scientific and technological progress is inconceivable without massive introduction of computer technology into industry and management. Until now, however, college students have been trained to use only general-purpose computers, mainly for calculation problems. But for control of industrial equipment (which is a major computer application in industry) one must be able mostly to solve logical problems.

Students can be trained for this function on ordinary microcomputers with simple built-in input/output and information editing devices, as well as units for debugging of programs and electronic assemblies which are adapted to particular tasks. The existing microcomputers, however, in a certain sense, lock out the student: They do not allow him to work directly with the microprocessor at the level of elementary logical signals (i.e., with the main storage and read-only memory and the units controlling peripheral devices). In view of this, VEF [Riga Electrical Engineering Factory (Valsts Elektrotekhniska Fabrika)], upon its own initiative, has developed a training microprocessor set [UMK] which consists of a microcomputer, an operator panel and a power unit.

UMK is a compact piece of equipment housed in an attache case; under the lid on the face side of the panel is a keyboard for entering data and controlling operation modes: testing and modifying the contents of registers and storage locations, moving information from ROM into main storage and starting a program. A built-in display on light-emitting diode matrices is used as the monitor.

The training microprocessor set is built around a widely used microprocessor KR 580IK80A. The main storage capacity is 1 kbyte; ROM capacity is 2 kbyte. Practically all of the main storage and half of the ROM can be utilized at the user's discretion.

Since the purpose of UMK is to learn the operation principles of typical microcomputer assemblies, a connector assembly is located on the face panel.

Connected to this assembly is an interchangeable printed circuit board which has circuits for conjugation with the microcomputer and an assembly field; the assembly field can be used for installing controllers of external devices, such as a photoscanner, a printer, an analog-digital or digital-analog converter, memory unit, etc.

General view of UMK microprocessor equipment created by VEF staff (photo by I. Diner).

A step-by-step program operation mode is provided with the light-emitting diodes on the face panel, representing the state of the buses (groups of wires) of the address, data and control. In this mode all signals on the external connector assembly are static, facilitating for the student the understanding of the circuits through which these signals are transmitted.

The main function of UMK is to train college students or users in the industry. It could also be used in senior high school classes, at PTU [industrial vocational schools] and junior technical colleges.

A course of training can begin with a study of the elementary logical functions and sequences of arithmetic and logical operations on one or several variables. This can be followed by mastering a hypothetical computer which would have a small set of instructions but a ramified addressing system. The next step could be training on a real microprocessor and a microcomputer based on it which makes up part of UMK. Finally, the trainees could study various interface units connecting the computer with the object of control and the input-output devices.

9922
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EXHIBITION OF COMPUTERS AND AUTOMATED CONTROL SYSTEMS

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 7, Jul 86 pp 23-27

[Article by Ye. T. Larina and O. N. Lutovinina: "Science-Engineering-Production-86," under the rubric: "At the USSR Exhibition of the Achievements of the National Economy"]

[Text] The "Science-Engineering-Production-86" exhibition opened on the eve of the 27th CPSU Congress and was a continuation of the highly successful "Scientific and Technical Progress-85" exhibition.

The popularization of scientific and technical progress is once again occupying a central place at the exhibition. The broad scope of the exhibits emphasizes the most important task posed in the "Basic directions of the economic and social development of the USSR for 1986-1990 and through 2000": "The highest goal of the economic strategy of the party was and remains the steady elevation of the people's material and cultural standard of living. The realization of this goal in the forthcoming period requires accelerated social and economic development, the intensification of all aspects of production and its improved efficiency on the basis of scientific and technical progress".

All units that combine science, engineering and production were represented at the exhibition, and a comprehensive picture was given of the conditions that promote a better and more rapid implementation of all that is new and progressive.

More than 2000 exhibits in 19 sections are demonstrated by more than 80 ministries and departments, the USSR Academy of Sciences and union republic academies, scientific and technical societies, scientific research institutes, design bureaus, and more than 800 scientific production associations and enterprises. Here one can become acquainted with a program for extensive social and economic reorganization implemented by current technology- from the "Vega" interplanetary space probe to a scholastic microcomputer, a fragment of an automated plant, and robots utilized in diverse sectors of the economy.

Special attention was directed at the exhibition to automated systems and computer facilities.

The ARM2-01 problem-oriented automated work station complex for graphic design was designed to solve automated design problems, including the interaction of several users with the computer, the conversion and editing of graphic

information, and interaction with higher-end YeS computer models. The ARM2-01 supports the operation of two types of operator work stations. One is based on a data entry and preparation terminal for large graphic information files, while the other can also edit and specify functional program commands. The ARM2-01 can encode, design, display on a console screen and edit the designs of quite complex entities.

An automated design and supply system for automatic lathe set ups (the "ARATON" automated design system) based on the ARM2-01 is used to design single-spindle automatic lathe set ups and to derive cam production control programs for NC machine tools. An operation plan provided by the manufacturing engineer comprises the input while the output is a printout of the manufacturing process flowsheet. The processing time for a documentation set for one set up is reduced by 8-9 times, while the cam production time is reduced by 4-5 times. The system makes it possible to work with a large number of domestic and foreign single spindle turret automatic screw machines and Swiss-type moveable-headstock automatic screw machines, and to autonomously operate independent subsystems.

The "Avtoshtamp" automated design system was designed to produce a production forms and records set for the manufacture of shearing dies, and includes subsystems for initial data entry and control, stamping production process design, designing and drawing the dies and requisite sketches, die part manufacturing process design and the derivation of control programs to produce them on NC machine tools.

The system can design 17 different types of shearing die structures, and its productivity calculated in terms of YeS computer capacity is 6 thousand designs per year on the average for three work shifts.

The RMOT-02 videoterminal subcomplex for process engineer-operator work stations is used in automated control systems (ASU) for complex technological processes in the chemical, petrochemical, metallurgical, power and other industries. The complex features extended capabilities, improved screen image quality, and higher reliability than the previously developed RMOT-01.

The ARM2-05 problem-oriented automated work station complex for microprocessor programming is used in automated design systems for programmable digital equipment, primarily built-in microprocessor units. The principle application of the complex is the automation of programmed (microprogrammed) microprocessor-based digital equipment design. Its distinguishing feature is two user operation modes: The first for developing applied programs that tune the complex to specific (objective) microprocessor unit designs, while the second is used to program and debug the objective microprocessor units.

The hardware selection problem for organizing a single level or the lowest part of a multilevel technological process ASU can be solved by the SM1634.15-SM1634.18 control computer complexes. The primary goal is the application of the control computer complexes as computer terminals to communicate with the controlled entity (TVSO-1).

The TVSO-1 is made to user order in a modification that corresponds to the

requirements of the automated entity and the tasks solved in the technological process ASU. The hardware and software of the TVSO-1 are oriented to the execution of the following functions: Gathering analog and digital signal data from transmitters, including those connected to remote transducers and switches, in a specified order and at a specified rate; initial and extensive processing of measuring results with standard and special algorithms; display of the measured parameters on the process engineer-operator's console upon his request, and the display and alteration of the monitoring bounds; display and recording of technological process disruption messages; periodic printout of reports regarding the controlled entity's operation; outputing analog and digital signals to the entity regarding the results of calculations made by user programs; exchange of data with a higher computer complex.

The TVSO-1 includes a SM 50/60 processor. The instruction set of the processor includes the basic set specified by the SM 50/60 architecture and an auxiliary set of problem-oriented instructions for analog and digital data input-output.

The TVSO-1 features a configuration that is modified to satisfy the customer's requirements, and is produced as a finished product. It can be programmed in high-level languages, is compatible with SM-1, SM-2, SM-2M and SM-1634 computer complex architecture; it provides a high data input-output speed and a wide choice of the number of required type of channels to communicate with the controlled entity, etc.

The SM 1210.01 host computer complex was designed for use in complex technological process ASU and in scientific experimentation systems. In addition, it is used to construct data processing centers in mass service systems, in automated systems to process the results of testing complex equipment, in computer networks, etc.

The complex usually includes two central processors and two input-output processors. They are interconnected and can access a shared 4 megabyte main memory. The data processing and system control functions are separated in the SM 1210 complexes. All data processing is accomplished in the central processors. The exchange of data between the devices and the main memory is controlled by a channel that is a part of each input-output processor. The channel can simultaneously execute up to 16 distinct operations in monopole, block multiplex and multiplex operation.

Local and territorially dispersed multimachine complexes can be configured with the SM 1210 (SM-2M, PS-3000).

The PS-3000 complex was designed for use in high speed data processing systems. It possesses an original architecture, without analog, with the means to address and process scalar and vector data.

The system features several functionally specialized processor groups that support several performance boosting methods. The PS-3000 computer complex has been used to create regional geophysical computer complexes for extensive processing of seismic prospecting data in regional geophysical computing centers.

The developments of the "Moskva" ASU Scientific Production Association occupied a prominent place at the exhibition.

The complex of interlinked automated Moscow municipal economy management systems ("Moskva" ASU) was designed to perfect and automate the management of all economic and social development of the municipal economy by extensively utilizing the methods of mathematical economics, computer facilities, communications equipment and office machines.

The "Moskva" automated management system is a combination of interlinked ASU: The municipal, intersectorial, rayon and sectorial ASU, the ASU of enterprises, associations and technological processes, etc. The complex is being developed as the territorial link of a state data gathering and processing system. Interaction with the automated control system for planning calculations of the USSR Gosplan and with other higher-level systems is being provided for in the creation of the complex. Establishment of the complex includes perfecting the forms and methods of social and economic planning and management, setting norms and stimulating production, economic operation and management processes, and developing planning and management automation equipment and technology.

At any hierarchical level the complex gathers, transmits, processes and analyzes data for the elaboration and adoption of resolutions by the appropriate management agencies. It also transmits these resolutions to the executors and supervises their execution.

The first stage of the ASU complex development must unite more than 500 ASU of associations, enterprises and organizations of the Moscow Municipal Executive Committee, in which several hundred technological process ASU, about 30 scientific research institute and design bureau ASU, more than 40 sectorial, 11 intersectorial, 33 rayon and 9 municipal ASU must function.

The automated system for scientific and technical information (ASNTI) is an integrated documental and factographic data retrieval system that increases the efficiency of scientific research and experimental design work conducted in Moscow Municipal Executive Committee organizations and accelerates the implementation of new equipment and progressive technology in the Moscow municipal economy.

The ASNTI automates the generation of sectorial and intersectorial scientific and technical data files on research and automation problems in the municipal economy, and provides reference information service to its subscribers.

The ASNTI relies upon a distributed data bank of scientific and technical data comprised of several data bases prepared by all-union scientific research agencies.

The "Moskva" ASU Scientific Production Association is exhibiting an automated work station for planners (planner ARM) based upon the "Iskra-126" personal keyboard computer which was designed to automate planning calculations at all planning levels. It can be used both as an independent computer or as a smart terminal for a central computer complex.

When the planner ARM is used as an independent computer, a local information fund (LIF) can be managed, data can be introduced from the console, data files generated in the central data fund can be loaded into the local data fund, data in the LIF can retrieved and corrected, data from the LIF can be used in applied programs, the LIF can be used to create a data retrieval system, computations can be made, programs can be executed, including those that utilize data obtained through communications channels, and independent parts of task programs implemented on a YeS computer can be executed.

The principle users of the ASNI KP [automated collective use scientific research system] in the Moscow municipal economy are collective subscribers (organizations) of the Moscow Municipal Executive Committee system who are using hardware, software and data facilities of the system to carry out research and development.

The first phase of the ASNI KP has provided for the creation of problem oriented subsystems for construction, automation, the municipal economy, transportation, fuel and power generation and public health, which include 16 modeling task sets, among which are a model that analyzes metal casting processes with casting stand technology, a simulation system for studying computer networks, a model for the disposition of population and labor resources, a model to analyze passenger flows in the municipal transportation system, etc.

The first phase of the ASNI KP has also provided for the creation of seven service subsystems, among which are research planning and execution, the input, processing and output of graphic information, interactive procedures and remote access, and an information service.

The ASNI KP provides methodological, information, hardware and software support.

The hardware complex of the ASNI KP is built upon the "Moskva" ASU Scientific Production Association hardware and local (branch) computer centers of the Moscow Municipal Executive Committee. The hardware complex possesses a three-level structure.

The establishment of an ASNI KP in the municipal economy makes it possible to reduce the labor input and duration of research activities while increasing their quality, preventing duplication of developments and improving the working conditions of municipal economy specialists.

The automated system for managing technical and economic information classification systems for the "Moskva" ASU complex (ASVK TEI ASU "Moskva") is an automated system for managing all-union and municipal classification systems of the ASU complex; it was developed for general systems information support as part of the systems support facilities of the "Moskva" ASU complex for managing the municipal economy sectors of the Moscow Municipal Executive Committee.

The ASVK TEI accomplishes the automated generation and management of an all-union and municipal ASU complex classification systems for the Moscow Municipal Executive Committee system, and it provides updated information regarding the

classification systems of systems interacting within the framework of the "Moskva" ASU complex by mean of periodic notifications according to user interests and requests. The ASVK TEI was patterned after a data bank, while its hardware complex is based upon a model 1033 or higher YeS computer with no less than 320 kilobytes of random-access memory (RAM).

The introduction of the ASVK TEI for the "Moskva" ASU complex makes it possible to create a management system for technical and economic information classification systems that is constructed from a single organizational and component operation principle while taking the fundamental tenets of the state system for all-union classification system management into consideration.

This provides automated system developers and the enterprises and organizations of the Moscow Municipal Executive Committee with current and reliable information about the all-union and municipal classification systems in the form of machinograms on storage devices or on a videoterminal screen.

The introduction of the system reduces the costs of creating and operating the "Moskva" ASU complex management systems by utilizing classification system information from the ASVK TEI.

The experience of Leningrad in carrying out the "Intensification-90" program was represented at the exhibition.

The ASOI-rayon automated data processing system as designed to automate integrated planning and management of the economic and social development of the administrative rayons of Leningrad. The system provides continued improvement of the integrated planning and adminstration of rayon development by introducing current methods and facilities for gathering, storing, preserving, processing, transmitting and displaying data.

The ASOI-rayon makes it possible to make calculations on the basis of the fundamental characteristics of integrated economic and social development plans for Leningrad, and the general municipal development plan; it provides the correct relationship between the development of enterprises and ministry (department) and municipal economic organizations; and it assures the systematic development of the administrative rayon while creating the most favorable conditions for the work, everyday life and relaxation of the population.

The next development stage of the ASOI-rayon poses the task of making analytical and optimization calculations and evaluating the quality of plans on the basis of logical and linguistic models and artificial intelligence methods for representing knowledge in the computer. This work is being conducted at the "Lensistemotekhnika" Industrial Association. The introduction of the ASOI-rayon reduces the time required to develop rayon plans by 2-2.5 times while improving their quality, increases their validity, organizes supervision of rayon plan execution and it improves the style and culture of labor.

The "Lensistemotekhnika" Industrial Association has developed an industrial software complex for local data base management ("Velobad" PKT) designed to create and manage "Iskra-226" information systems both when used by an autonomous

user and when connected with other information systems. The "Velobad" PTK can accomplish the following functions: Local data base design; design data input-output formats; load and update local data bases from the keyboard (according to an input format or without one) or through a magnetic storage medium (magnetic disc or tape); retrieval of data in the data base and its display upon request (according to a display format or without one); output the data from the local data base upon request and write it in the required format on a magnetic medium (magnetic disc or magnetic tape); run user programs to make calculations or perform other operations not supported by the software provided; execute service procedures for data set maintenance (encoding, marking discs, etc.); create and edit design plans and specifications for newly developed information systems; edit output machinograms obtained from YeS computers as printed pages written on magnetic tape during actual use of the information system.

The "Velobad" PTK used in the creation of information systems makes it possible to significantly reduce the information system development time in comparison with the existing technology by developing unique software with minimum continuity coefficient for each task and to accelerate development since the "Velobad" PTK implements the technological processes (data storage, updating of information, its output) required by each information system.

The user need only implement the particular information processing procedure for the given information system.

The "Velobad" PTK is currently used to develop and organize local data bases for end users in the distributed data base of the Leningrad Municipal Planning Committee's automated system for planning calculations. The "Velobad" PTK facilities are used to design industrial sector automated control systems for the manufacture of integrated automated production control systems in a number of cities and oblasts of the nation.

Various peripheral devices were submitted to the exhibition.

The SMP 6408 graphic information output device (flatbed graphics plotter) was designed to output onto paper information that is represented as a graphic image in a rectangular coordinate system: Sketches, schematic diagrams, graphs, and symbols.

The device can be used with SM computer and ASVT PS computer complexes, and at the automated work stations of computer-assisted design systems.

The device is operated by a microprogrammed controller. The controller microprograms are stored in a read-only memory (ROM). The graphic information is inputed to the device from the computer complex or external magnetic tape unit and written in the device's RAM. Interfaces connect the graphics plotter with the computer complex.

Graphic information is sent in bytes from the computer complex to the plotter, while eight-bit status words are transmitted back to the computer complex. The input language (instruction set) is a CCL-7-encoded symbolic language that

contains instructions for pen control, drawing vectors at any angle, arcs, circumferences, Russian and Latin alphabet symbols, digits and special symbols.

A control unit processes the graphic data and transmits control signals to two stepper motors which move a pen unit carriage by means of a cable system.

The information is recorded on paper by articulated pen units. The paper is secured to the plotting bed by a vacuum clamp.

Control console pus. buttons enable the operator to vary the drawing speed, acceleration, scale, pen lowering delay and to specify the data source and other modes of operation.

The principle components of the graphics plotter are a pedestal, a two-coordinate mechanism and a rack. The pedestal contains the microprogrammed controller, a RAM module, ROM's, the BIF-106 interface unit, control units, a power supply, fan units, wire bundles and connectors.

The two-coordinate mechanism includes an operator console and the PU-27 control console, a pump, a carriage with electromagnet unit, and two reduction gears with motors.

The external memory unit, which is available in two versions, is housed in the rack. The average service life of the plotter is 10 years, and the serviceability recovery time is 1 hour.

Specifications of the SPM 6408 graphics plotter

Type of graphics plotter	Flatbed
Data medium	Drawing or cartographic paper
Writing method	Mechanical
Pen unit	Articulated
Working field format	A1 (594 by 841 mm)
Number of pen colors	3
Smallest addressable step size, mm	0.1
Resolution, mm	0.05
Repeatability, mm	0.15
Maximum pen velocity (each axis), mm/s	600
Static and dynamic error, mm	
no greater than	+-0.2
Coordinate system	Relative and absolute
Interpolation	Linear and circular
Alpha-numeric character sets	2
Power consumption, kVA	Up to 1.2
Overall dimensions, mm:	
writing unit	1000 by 1300 by 1700
magnetic tape unit	680 by 680 by 1280
Weight, kg	Up to 360

The SM computer local-area computer network is comprised of two host process control computer complexes (UVK) whose built-in processors differ. They are

connected by an IRPS (20 mA current loop) interface.

The host UVK include an SM 1300 or SM 1300.01 processor, magnetic disc external memory unit with a 4.8 to 19.2 megabyte capacity, alphanumeric videoterminal, printer, two-channel IRPS controller and a peripheral interface controller.

The SM 130 host UVK possesses a 28,000-word RAM and a hardwired loader that can boot operating systems from various peripheral devices, including through the computer network. It was designed to be used as a network terminal computer.

The SM 1300.01 host UVK has a 124,000-word RAM (with memory controller) and an extended instruction set. The complex was designed to be used as a terminal computer or message switching center.

The software of each computer included in the single-vender SM computer local-area network provides the ability of using the OS-RV operating system with a network program package.

The network packages can establish session connections, transfer files, transmit and execute indirect instruction files and monitor the quality of the transmitted data while outputing transmission error messages.

Distributed and (or) generated operating systems and teleprocessing program packages can be supplied upon user request when extended-configuration systems are ordered.

Each of the UVK can be augmented upon user request with external magnetic tape, magnetic disc or floppy disc memory units, analog or digital signal interfaces, and a number of SM-computer devices (bus selector, programmable timer, etc.). About 30 such devices are available.

Problems in configuring auxiliary devices, electrical interconnection, system testing, etc., are solved by the manufacturer while considering the customer's requirements.

The "Elektronika NMS 01100.1-02" interactive computer complex (DVK) is a fundamentally new class of universal personal microcomputer which can supervise all stages of data processing and storage. The DVK can be used for mathematical and scientific and engineering calculations in reference information systems and as development engineer and designer work stations in computer-assisted design systems.

The DVK includes an "Elektronika NMS 1201.01" microcomputer, a 15IE-00013 display; "Elektronika NGMD-6022" floppy disk drives, the 15VVP-002 thermal printer or the UVVPCh-30-004 dot matrix printer.

The YeS 1840 personal professional computer (PP EVM) was designed to automate individual labor: Scientific, engineering, economic and other calculations and research; design automation; management design; measuring, recording, data retrieval and training systems.

The YeS 1840 PP EVM is the first Unified System personal professional computer in the USSR.

The YeS 1840 PP EVM is a table-top computer which can work both autonomously and in local-area and global networks.

The PP EVM with its software satisfies the needs of a wide variety of users by operating in Russian while simultaneously supporting the systems and application software of similar foreign PP EVM (IBM-compatibles), which provides well-developed application software support.

The YeS 1840 PP EVM implements software selection of display and printing character generators, which makes it possible to utilize different alphabets and create national versions of the YeS 1840 PP EVM application software for the Council for Mutual Economic Assistance member-nations and the republics of our nation. Diverse peripheral devices (the basic set includes a display, keyboard, printer, etc.) can be connected to the YeS 1840 PP EVM.

A modular design and universal interface with diverse capabilities for variation and expansion according to the size of the task make it possible to:
Utilize auxiliary modules that are suited to particular professions and auxiliary peripheral devices (graphics plotters, digitizers, analog to digital signal converters, etc.);
replace one type of peripheral device for another.

The YeS 1840 PP EVM is easy to service and convenient to operate.

The PP EVM systems software includes an operating system, service programs that support media and real-time correction and that tune the system to the parameters of a particular configuration, the TELETEKST program that can transfer files between the YeS 1840 and other YeS computers through the C2 interface, the BASIC M86 programming system, and the "ABAK" basic applied program package.

The systems and application software for the widely used IBM PC can be run on the YeS 1840. The MIKROS86 operating system which features an emulator for the OS1800 systems and application software of the SM 1800 8-bit microcomputer can also be used.

The test program set can confirm the serviceability of the YeS 1840 PP EVM functional units and copy test diskettes.

The "AGAT" personal computer is oriented to users without special training, and was designed for mass consumption in education, services and public health.

A distinguishing feature is the modular implementation of its structural, functional and architectural capabilities. The "AGAT" personal computer allows the user extensive capabilities for displaying alphanumeric and graphic information on a color monitor. A floppy disk drive comprises the external memory.

The user must know how to use the keyboard and execute the instructions on the

screen which allow the user to choose from several alternatives.

Specifications of the "AGAT" personal computer

Overall dimensions (without external devices), mm	500 by 371 (5 by 188)
Weight, kg	12
Word length, bits	8
Speed, operations/h	3.5×10^5
Capacity, kilobytes:	
ROM	64-256
RAM	32
External memory	2 NGMD YeS-5088.02 (250 kilobytes)
Data display parameters:	
alphanumeric	32 by 32 characters (8 colors), 64 by 32 characters (Russian and Latin alphabets, lower-case and capital letters)
graphics	256 by 256 points, 128 by 128 points (8 colors), 64 by 64 points (16 colors)
Keyboard	Autonomous, connected by a serial channel with the CPU, 74 keys including 15 function keys
Interface:	
internal	"AGAT" bus (60 lines, 7 connectors)
external	one serial channel, two parallel channels
Printer	YeS-7189 mosaic printer
Power consumption (without external devices)	60 Wt from 220 V line
Systems software	Disk operating system, BASIC, systems monitor, "AGAT" personal computer test programs, interpreter for the "Rapir" industrial training language
General purpose software	Text editor, graphics editor, numerical modeling system (spreadsheet)

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